A BIOLOGICAL INVENTORY AND EVALUATION OF THE CREDIT FORKS AREA OF NATURAL AND SCIENTIFIC INTEREST

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A BIOLOGICAL INVENTORY AND EVALUATION OF THE CREDIT FORKS AREA OF NATURAL AND SCIENTIFIC INTEREST (30M/13 820500)

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Ontario Ministry of Natural Resources
Parks and Recreational Areas Section
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SUMMARY

The Credit Forks Area of Natural and Scientific Interest (ANSI) is an area of 337 hectares in the Town of Caledon, Regional Municipality of Peel. The ANSI includes forested lands on the foot, slopes, slope terraces and plateau of the Niagara Escarpment on both sides of a re-entrant valley along a section of the Erin (or West) Branch of the Credit River. The Credit Forks ANSI lies east of the community of Belfountain, its western boundary abutting the east boundary of the Credit Valley Conservation Authority property known as the Belfountain Conservation Area.

The Credit Forks ANSI lies within ecological site district 6-7, a narrow environmental zone that extends from the east end of Rice Lake in Northumberland County to the west flank of Peel Region, encompassing the crest and upper slopes of the Oak Ridges moraine and including the Niagara Escarpment from Terra Cotta north to Gibraltar in Grey County (Lindsay 1984). The ANSI lies in the Dufferin (or central) Section of the physiographic unit known as the Niagara Escarpment, a dramatic shale and dolostone escarpment that traverses an irregular diagonal across southern Ontario from Niagara Falls to Tobermory on the Bruce Peninsula (Chapman & Putnam 1984).

In 1976, the Credit Forks ANSI was designated an escarpment-related "Candidate Nature Reserve," because it is an excellent representative site in the Dufferin Section of the Escarpment (OMNR 1976). Lindsay (1976) identified the tableland deciduous forest, south of the escarpment rim, as the best example of this vegetation-type along the Dufferin Section. As a result of this assessment and a subsequent general evaluation of remnant natural areas in southern Ontario, the Ministry of Natural Resources has identified the Credit Forks ANSI as a provincially significant life science site (OMNR 1983). The present study is intended to 1) increase knowledge of the physical and biological features of the ANSI; 2) assess the present condition of the site and identify current or potential land use changes and impacts; 3) refine boundary location; and 4) identify landowners with holdings in or adjacent the ANSI.

The principal physical attributes of the Credit Forks ANSI are the Niagara Escarpment slope and exposed cliff face, the Escarpment plateau, the re-entrant valley of the Erin Branch of the Credit River, and the Credit River itself. With as much as 110 m displacement between the valley floor and the escarpment brow, there are many stunning views into and across the re-entrant valley and the valley of the main channel of the Credit River. The sections of exposed escarpment face that are visible from the valley floor add a dramatic and rugged quality to the height of land south of the Credit River.

The major vegetation unit is forest (314 ha representing nearly 93% of the ANSI area), of which five landform-associated sub-units have been distinguished: a) tableland; b) slope (including talus); c) escarpment rim; d) terrace; e) valley floor; and f) bottomland. Minor vegetation-types include riparian vegetation (on the 2640 m of stream course along the Erin Branch and main channel of the Credit River); slough or seasonal wetland vegetation (in several hollows or shallow sloughs on the escarpment tableland); and a variety of anthropogenic communities along transportation corridors (9.0 ha, including railway and roads), in several small clearings (6.7 ha) and around building envelopes (4.0 ha). While these minor types occupy areas that total only 7% (20 ha) of the ANSI area, they contribute a great diversity of habitats and species to the ANSI. The river itself has a limited flora of vascular plants due to its moderately turbulent flow combined with sections of silty or gravelly substrate within the ANSI boundaries.

The inventory identified 260 species of vascular plants, 2 species of amphibians, 19 species of birds and five species of mammals as resident in or utilizing the ANSI. Of the plants, 23 species are trees; 24 species are shrubs, small trees, or vines; 18 are ferns or their allies; 44 are graminoids; and 151 are forbs. An additional 12 species of plants, 6 species of fish and 1 species of amphibian are reported in other studies of the Credit Forks ANSI. The tableland forests are composed primarily of deciduous trees

with sugar maple (Acer saccharum) as the leading dominant, with white ash (Fraxinus americana), beech (Fagus grandifolia) and basswood (Tilia americana) present as minor elements. On the escarpment slopes, sugar maple and eastern hemlock (Tsuga canadensis) are dominant on loamy soils, white cedar (Thuja occidentalis) is dominant on weathered clay, and white birch (Betula papyrifera) is the dominant on talus. On the narrow band of escarpment rim, white pine (Pinus strobus) and white cedar are the dominants. The slope terrace forests are also dominated by sugar maple but are more heterogenous than the tableland forests and include black cherry (Prunus serotina), eastern hemlock and white pine, as well as white ash, beech and basswood. The bottomland forest is dominated by white cedar.

The vegetation and plant communities are characteristic of the landforms on which they occur in the regional environment of site district 6-7 and provide extremely valuable representation of biological communities which have been much depleted by human activities. The presence of these plant communities on a dramatic and relatively undeveloped stretch of the Niagara Escarpment enhances greatly the significance of both the biological communities and this outstanding physical feature. The only other natural area of comparable vegetation types and escarpment-related features in site district 6-7 is at Mono Cliffs Provincial Park, but the park does not have the extent and complexity of cliff and talus communities, nor the bottomland communities along major streams, nor the great size and high quality of escarpment tableland deciduous forest. In nearly all instances, these communities at Credit Forks ANSI are maturer and better developed than those at Mono Cliffs.

One provincially rare species, ginseng (Panax quinquefolium), has been collected from the ANSI (Lindsay 1976, in litt. 1989) and another, hart's-tongue fern (Phyllitis scolopendrium), was present in the early 1960's (Catling in litt. 1989). One species of regional rarity, water starwort (Callitriche verna), has been identified from a back-water of the Erin Branch of the Credit River within the ANSI boundaries. Four regionally restricted species, maidenhair spleenwort (Asplenium trichomanes), green spleenwort (Asplenium viride), walking fern (Camptosorus rhizophyllus) and smooth cliff brake (Pellaea glabella), that are only found on the rocks or talus of the escarpment, have been identified or previously collected within the ANSI. Also, an exotic member of the mint family, mother-of-thyme (Satureja acinos), found along the gravel road of the Willoughby property provides the first record of this species in Peel Region (Webber 1984).

Observations of wildlife were made on a casual basis during the field work in 1988 and relatively few species were seen. Those that have been seen are common species that are likely resident in the immediate vicinity. Species such as the eastern pewee, wood thrush and American goldfinch are almost certainly summer residents. Birds like the blue jay, black-capped chickadee and white-breasted nuthatch are permanent residents of the forests. In 1989, an early winter examination of the forested slopes below the escarpment revealed an extraordinary number of small mammal tracks, including mice, lagomorphs (hares and/or rabbits) and canids (fox and/or coyote). The numerous crevices and fissures in the escarpment wall and the holes, crevices and tunnels created by the bouldery talus provide a wealth of den sites for small mammals.

The vegetation in the majority of the ANSI area has not experienced any serious, recent disturbance. Although estate development is occurring along Caledon Mountain Drive, the vegetation beyond the building envelopes is not being seriously affected by the construction. That absence of disturbance to the vegetation, the approaching maturity of the forest communities and the distinctive and dramatic exposures of the Niagara Escarpment are taken as factors that confirm the assessment of this site as provincially significant.

Through the Natural Heritage Stewardship Program of the Natural Heritage League, the designation and significance of the Credit Forks ANSI has been brought to the attention of landowners holding property within its boundaries. A generally positive response has been forthcoming from landowners and stewardship agreements have been made covering about 172 ha of the ANSI (Moull 1988).

PREFACE

The Maple Administrative District of the Ontario Ministry of Natural Resources includes the Regional Municipalities of Peel and York, Metropolitan Toronto, and the western edge of the Regional Municipality of Durham. The District stretches from the Lake Ontario shoreline to the middle of Lake Simcoe (Figure 1), thereby including some of the most densely populated lands in the province.

The assessment of Areas of Natural and Scientific Interest (ANSIs) in Maple District is made within the ecological framework of site regions developed by Hills (1959) for the Ministry of Natural Resources and with special recognition for the Niagara Escarpment physiographic area. Maple District lies within both Site Regions 6, the Lake Simcoe–Rideau Site Region, and 7, the Lake Erie–Toronto Site Region. It encompasses parts of seven ecological site districts designated 6–1, 6–5, 6–6, 6–7, 6–8, 6–13 and 7–4, though only three, 6–7, 6–8 and 7–4, occupy relatively substantial areas in Maple District (Fig. 1). In each of these ecological site districts, the ministry has reviewed and assessed the natural areas which presently reflect pre–settlement conditions. Using the criteria of 1) representation, 2) diversity, 3) condition, 4) ecological considerations and 5) special features, various levels of significance ("provincial," "regional" or other) have been assigned to the best examples of these remnant natural areas (e.g. Lindsay 1984).

Known as Areas of Natural and Scientific Interest (ANSIs), those areas of greatest significance were identified in the Maple District Land Use Guidelines (OMNR 1983). The Ministry of Natural Resources has undertaken to encourage the protection and conservation of the natural elements and character of those ANSIs which are deemed provincially significant. In addition to the designation of ANSIs, the ministry is also actively involved in various aspects of the planning and implementation of the Niagara Escarpment Plan.

This report deals with one of the provincially significant ANSIs in Maple District, the area known as Credit Forks which lies within the Niagara Escarpment Planning Area within ecological site district 6–7 (OMNR 1976; Lindsay 1984).

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INTRODUCTION

The Credit Forks Area of Natural and Scientific Interest (ANSI) is an area of 337 hectares located in the Town of Caledon, in Caledon Geographic Township. Encompassing just over 3.5 km of an east-west oriented portion of the Niagara Escarpment south of Forks of the Credit, the western boundary of the ANSI lies immediately east of the Hamlet of Belfountain. Its eastern boundary lies 2 km west of the Hamlet of Inglewood (see Fig. 1). The area is centered on latitude 43° 48' N. and longitude 80° 01' W. with Universal Transverse Mercator Grid coordinates of 5820E.48500N. in Zone 17 (NTS 1984, 1985).

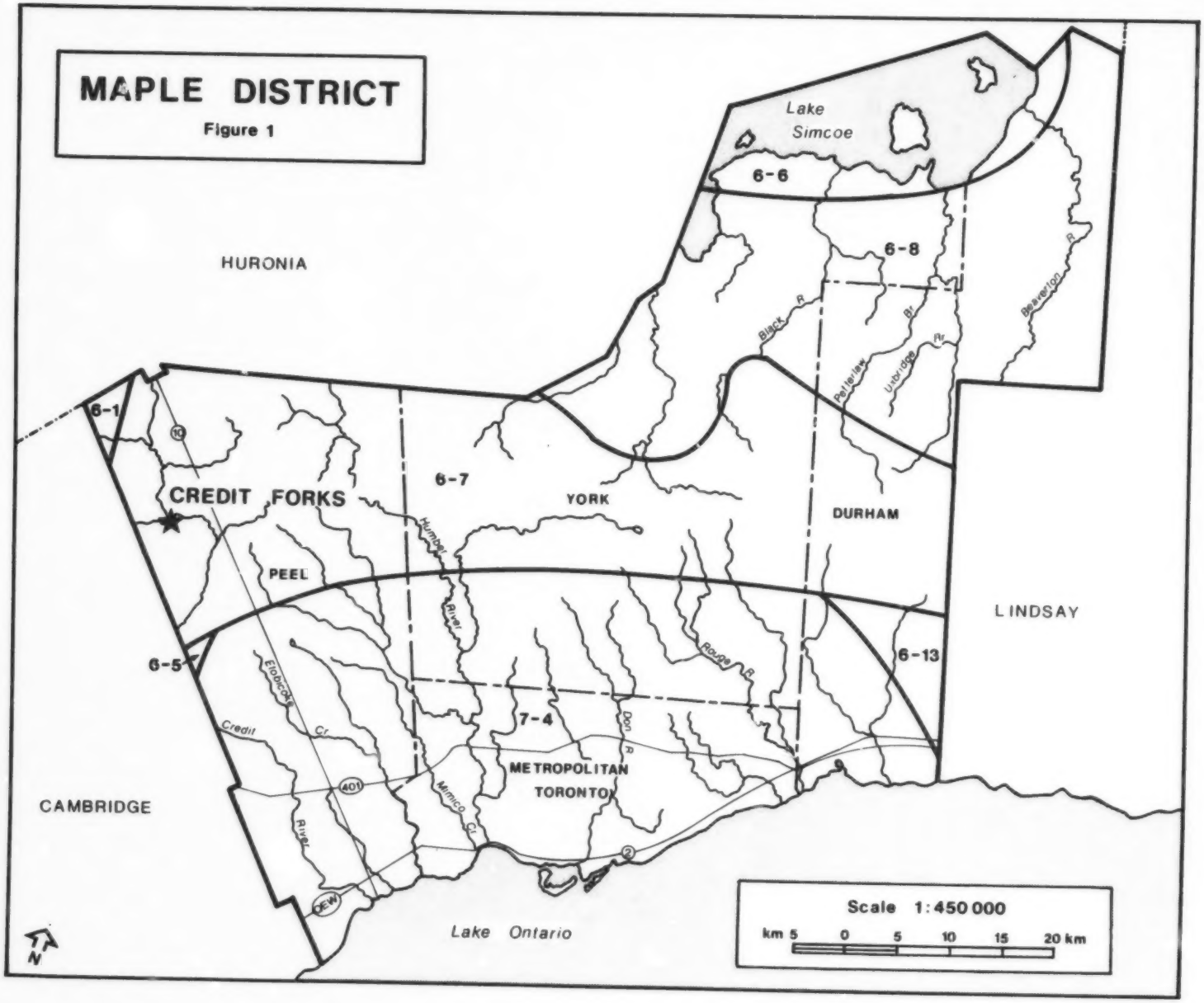
In 1976, as part of a program of natural area identification and assessment within the Niagara Escarpment Planning Area, the biological resources and values of the area were reviewed and assessed by Ministry of Natural Resources staff (OMNR 1976). As a result of that study, the Credit Forks natural area was designated a "candidate nature reserve." In 1983, following a review of significant natural areas in the ecological site districts of southern Ontario, during preparation of the ministry's land-use guideline for its Maple District, the area was designated a provincially significant ANSI (OMNR 1983).

The Credit Forks ANSI lies entirely within the Niagara Escarpment physiographic unit (Chapman & Putnam 1984) and contains excellent examples of typical physical escarpment features such as exposed escarpment face (cliffs), crevice and overhang caves, steep, boulder-strewn slopes and terraces, and mid-slope seepage. Flanking the north and south sides of an escarpment re-entrant valley, the ANSI includes a section of a major tributary of the Credit River. This east-flowing Erin (or West) Branch of the Credit River joins the south-flowing Alton (or East) Branch of the Credit River some 300 m east of the ANSI boundary at Forks of the Credit. Some distance beyond that confluence, the main channel of the Credit River makes a 1 km pass through the northwest edge of the ANSI, cutting across the toe of the escarpment formation. On the tableland above the escarpment, the ANSI includes a large area of both flat and rolling plain that represents a section of the easternmost extent of the Paris moraine (White 1975).

Ecological site district 6-7 is centered on the crest and slopes of the Oak Ridges moraine with some minor portions of the Peterborough Drumlin Field in the east. A northward extending finger in the west follows the Dufferin Section of the Niagara Escarpment between Terra Cotta in Peel Region and Gibraltar in Grey County (Lindsay 1984). This site district lies within three administrative sub-divisions within the ministry's Central Region: the eastern section is in the Lindsay Administrative District; the western section is in the Maple Administrative District; and the northern "finger" is in the Huronia Administrative District. Credit Forks ANSI lies in the section of ecological site district 6-7 administered by Maple District.

The biological investigations and assessments of natural areas made during the preparatory stages in the development of the Niagara Escarpment Plan were not full and comprehensive investigations of each area covered, but rather comparative evaluations intended to select the most significant natural areas for identification and special designation in the Plan (e.g. Niagara Escarpment Commission 1982). The ministry recognized that further and more detailed investigations were needed.The present study addresses the need for detailed up-to-date information on the biological features of the Credit Forks ANSI with an assessment of the condition and significance of those resources.

Lying within the Niagara Escarpment Planning Area, this information on the natural features of the Credit Forks ANSI will be of use in the local achievement of the goals of the Niagara Escarpment Plan. Most of the ANSI area is designated Escarpment Natural Area in the Plan (Niagara Escarpment Commission 1982). The westernmost 4.2 ha of the ANSI is within a property, the Belfountain


MAPLE DISTRICT
Figure 1
Lake Simcoe
6-6
6-8
HURONIA
Black R.
Pefferlaw Br.
Uxbridge Br.
Beaverton R.
6-1
10
CREDIT FORKS
6-7
YORK
DURHAM
Humber River
PEEL
LINDSAY
6-5
Etobicoke Creek
Credit R.
7-4
Don R.
Rouge R.
6-13
METROPOLITAN TORONTO
401
Mimico Cr.
CAMBRIDGE
Credit River
QEW
2
Lake Ontario
N
Scale 1:450 000
km 5 0 5 10 15 20 km

Conservation Area, owned by the Credit Valley Conservation Authority. The Master Plan for this Conservation Area designates this portion of the ANSI as "natural area," to be managed to "prevent the destruction" of the unique features of the area (CVCA 1984). The ANSI area also includes a recent 39.4 ha acquisition of the Ontario Heritage Foundation, a parcel known as the Willoughby property, for which management planning is underway. The material herein will provide a background for the development of a land-use plan for the Willoughby property.

As the ministry and the Niagara Escarpment Commission begin to address their undertakings to protect and conserve Ontario's biological heritage and the outstanding physical feature known as the Niagara Escarpment, the owners of properties within selected significant natural areas within the Escarpment Planning Area are being contacted through the Natural Heritage Stewardship Program, operated by the University of Guelph for the Natural Heritage League and funded by the Niagara Escarpment Commission. The Credit Forks ANSI has been one of the areas selected for the Niagara Escarpment Private Stewardship Project. To date, stewardship agreements have been negotiated with 18 landowners controlling the majority (51%) of lands in the Credit Forks ANSI (Moull 1988; see Appendix B).

METHODS

Background documents in the ministry's natural areas files were examined for information relevant to Credit Forks ANSI. The reports by OMNR (1976) and Lindsay (1976, 1984) were closely scrutinized. Works dealing with the physical features of the general area were consulted prior to and during the field work (e.g., Chapman & Putnam 1984; NTS 1984, 1985). Various individuals with particular knowledge of the area, ministry staff with data files that dealt with the area and staff at municipal and government agencies with administrative jurisdiction over the area were interviewed about the ANSI area.

Aerial photographs (OMNR 1978) at a nominal scale of 1:10,000 were examined with a pocket stereoscope. The airphoto analysis was used to distinguish different vegetation communities and to direct the field investigation to particular areas. Airphotos were used to identify plant community boundaries, as well as access points and trails.

Forest Resource Inventory (FRI) photomosaics (OMNR 1979) were examined to identify forest stands. The data in the FRI was used to compile a preliminary list of forest dominants and to determine the extent of area on which those species were principal dominants.

Site visits were made on 5 July, 16 and 18 August, 8 September, 4 November 1988, 11 January and 28 May 1989. All visits were for a full day except those of 18 August, 11 January and 28 May.

Different routes were traversed on each of the investigative visits with different areas being selected for close scrutiny during each visit. Species lists and notes were made for the various habitats and communities. Plant species difficult to identify in the field were collected for critical examination at the Erindale Herbarium of the University of Toronto. Identifications were made using Edward Voss' Michigan Flora: Part 1, Gymnosperms and Monocots (1972) and Part 2, Dicots (Saururaceae - Cornaceae) (1985), and H.A. Gleason's New Britton and Brown Illustrated Flora of the northeastern United States and adjacent Canada (1952).

Base maps at a scale of 1:10,000 (OMNR 1980) were used for the field investigations. The maps for this report, at a scale of 1:5,000, were prepared by staff of the Parks and Recreational Areas Section, Central Region, Ontario Ministry of Natural Resources, derived from the maps of the ministry's Ontario Basic Mapping of the area at a scale of 1:10,000 (OMNR 1980).

PHYSICAL SETTING

GEOLOGY

The Credit Forks ANSI is located along a 3.5 km stretch of the Dufferin Section of the Niagara Escarpment. An extensive and prominent exposure of the escarpment face occurs here, but there are no exposures of plateau pavement except for some small areas at the escarpment brow. The escarpment is the eroded relict crest of the outer edge of a large, saucer-shaped rock formation of ancient metamorphosed marine sediments and reefs that formed in a shallow sea that once covered north-central North America. The present-day Niagara Escarpment describes an irregular arc from Niagara Falls to Tobermory on the Bruce Peninsula, continuing in less spectacular fashion as Manitoulin Island and the other limestone islands of the North Channel of Lake Huron (Gosselin et al. 1975).

Consisting of marine shales, sandstones and carbonates (dolostone and limestone) of Ordovician and Silurian age, the escarpment was overridden during the various Quaternary glacial episodes and buried to a greater or lesser extent, particularly in the portion that extends through northern Peel, Dufferin and southern Grey Counties. Though often evident as a drift covered bluff in this Dufferin Section, the escarpment exposures at Credit Forks are among the best and most dramatic north of Milton and south of Owen Sound.

At Credit Forks, the caprock of the escarpment is the Amabel Formation, a hard, erosion-resistent, massive-bedded, fine-crystalline dolostone (OGS 1981). This formation is 9 m to 13 m thick in the vicinity of Credit Forks and is visible as the brow and upper face of the escarpment exposures. Below the caprock is a 4-8 m thick complex of several shale and dolostone formations of the Clinton (mainly the Reynales or Fossil Hill Formations) and Cataract (including the Cabot Head, Manitoulin and Whirlpool Formations) Groups (Gosselin et al. 1975). These are partly buried by the glacial outwash deposited in the valley, and by shales weathered in situ, but occasionally appear as a zone of fractured and broken rock on the face of the cliff below the relatively massive bedded face of the Amabel Formation. Members of the Clinton and Cataract Groups are also exposed on the north edge of the ANSI at about UTM 5803E. (see Fig. 3 for UTM coordinates) where Forks-of-the-Credit Road ascends the escarpment. Below the Cabot Head strata is the Manitoulin Formation of thin-bedded, fine-crystalline dolostone with numerous shaly interbeds.

At Credit Forks ANSI, the Manitoulin and other older bedrock formations are buried by glacial outwash piled up against the lower portions of the escarpment (White 1975) and weathered Cabot Head shales. Below the Manitoulin Formation is the Whirlpool, a 3-5 m stratum of thin- to massive-bedded, quartzose sandstone that has or had commercial value as building stone. Shortly before the turn of the century it was quarried as Credit Valley Stone and was used in the construction of the Ontario Parliament buildings and the Royal Ontario Museum (OGS 1981; Brown 1986). Below the Whirlpool Formation is the Queenston Formation, an erosion- prone, red shale that is mostly buried by outwash at Credit Forks. The Queenston Formation is well exposed on the south-facing slope above the Credit River, north of the ANSI, and in the gorge of the Credit River south of Cataract.The lowermost bedrock formation of the local region is the Georgian Bay Formation of thin-bedded siltstone and shaly limestone, dating from the early Ordovician (OGS 1981). No exposures of this formation occur in the general vicinity of Credit Forks ANSI.

SOILS AND PHYSIOGRAPHY

On the tableland, south of the escarpment, the soils of the ANSI have been classified as Dumfries loam, a stony, grey-brown, freely draining soil with a neutral pH reaction and moderate fertility (Hoffman & Richards 1953). This soil is shallow and occurs on the irregular to steeply sloping lands extending back from the escarpment brow as well as the tableland of the escarpment "fingers" north of the Erin Branch of the Credit River. The parent is a stony grey calcareous till that is present within 15 cm of the surface. The shallow upper horizons and general stoniness make this soil unsuitable for agriculture. Along the south edge of the ANSI are a couple of pockets of Caledon loam, a slightly stony, dark brown, circumneutral loam with somewhat better agricultural potential. However, a stony B horizon limits the utility of this soil (Hoffman & Richards 1953). A small pocket of Caledon loam is also present within the ANSI at the north edge where Forks-of-the-Credit Road approaches 2nd Line West (see Fig. 3 for locations).

On the slope and toe of the Niagara Escarpment, the soil is classified as Farmington loam, a shallow soil of variable stoniness and neutral to slightly alkaline soil pH. The soil is generally young with poorly developed horizons. Where seepage occurs, it is experiencing severe, on-going erosion, often with a build-up of muck or calcium carbonate or both. The origin of this soil unit at this location is not discussed by Hoffman & Richards (1953) but it would appear to be a mosaic of weathered glacial outwash (White 1975) and shale originating from strata of the escarpment, below the Amabel Formation.

On the west section, between the dam at the Belfountain Conservation Area (UTM 5796E.) and UTM 5822E., large boulders, singly or in massive slides, are present across the slopes. Most or all of this talus is of recent origin (post-glacial) and attests to the continuing action of erosion and the undermining that occurs along the seepage zones. On the east side of the ANSI, the shallow soil on the escarpment slope is mostly weathered shale, with very few boulders.

A small area of bottomland soil is present along the course of the Erin Branch of the Credit River, west of the inactive, stone dam on the Willoughby property, at UTM 58033E. 48497N. An equally small area of bottomland soil is also present along the main channel of the Credit River in the northeast corner of the ANSI. These are young, flood-prone soils that experience periods of accumulation due to deposits of alluvium and episodes of catastrophic erosion due to the spring freshet or similar flood events. Soil qualities are highly variable and fertility is generally low due to the sandy composition of the soil.

The tableland above the Niagara Escarpment begins as a moderately flat plain, representing an outwash plain, that becomes rolling 100-200 m from the rim of the escarpment, where the Paris moraine begins (White 1975). Particularly on the southern half of the tableland, numerous hills and hollows are present with a topographic displacement of 8-10 m. Many of the depressions are poorly drained and water-filled. About 150 m from the brow of the escarpment, a road, Caledon Mountain Drive, follows the curve of the escarpment between 4th Line West and Number 5 Sideroad.

The Niagara Escarpment follows a nearly east-west orientation through the ANSI. At Forks-of-the-Credit, where the escarpment swings north or northwest, the preglacial valley carved across the edge of the escarpment maintains the east-west orientation within the ANSI. This re-entrant valley is a complex feature with two principal valleys, in which the Erin and Alton Branches of the present-day Credit River flow, and one minor valley, in which the Forks-of-the-Credit Road has been constructed.

The valley of the Erin Branch is relatively short and buried beyond the Belfountain Conservation Area, just west of the ANSI. The exact size and form of the preglacial feature is not clear, but it appears that the Amabel Formation lies west of Belfountain and continues north-northeast beneath outwash deposits (Cowan 1976). Both till and meltwater deposits of Caledon outwash are present in the surficial deposits

around Belfountain (Cowan 1976; OGS 1981) and the topography is complex and irregular. The minor valleys between the Erin and Alton Branches of the Credit are cut into these deposits. The valley of the Alton Branch is largely cut into the Queenston Formation (Cowan 1976) and this feature may be entirely postglacial (or at least Quaternary) in origin.

Although clearly evident, the Niagara Escarpment is buried beneath weathered shale at the east end (White 1975) and glacial outwash at the west end (Cowan 1976) of the ANSI. However in the central section of the ANSI, from UTM 5807E. to UTM 5822E., more or less continuous exposure of the upper bedrock formations of the escarpment occurs (see Geology, above; Fig. 4). The sheer cliff ranges in height from 10–15 m, below which is a terrace that varies in width from one to 6 m. Below the terrace, the slope continues moderately steeply to the bed of the Canadian Pacific Railroad line that runs through the east half of the ANSI. Below the railway tracks, the slope again continues moderately steeply to the valley lands. Smaller or larger intermediate terraces are present along the escarpment slopes but no regular pattern of development is evident. Topographic relief along the escarpment within the ANSI ranges between 105 and 150 m from the brow to the valley floor. Such dramatic exposures of the upper formations of the escarpment next reappear 30 km south of the ANSI at Milton or 30 km north at Mono Cliffs.

North of the Erin Branch of the Credit River, the valley walls reach heights of 45–60 m above the river. A 200–300 m wide finger of elevated tableland extends to within 300 m west of the confluence of the Credit River branches and overlooks Forks-of-the-Credit Road to the north and east and the escarpment slope to the south. It is on this finger of tableland that the Willoughby house was built (see below). On the north edge of the ANSI (between UTM 5800E. and 5807E.), west of the confluence, a steep slope and an exposure of the escarpment face marks the south wall of the minor valley in which the Forks-of-the-Credit Road is present.

WATER

1. Water Courses

The Erin (or West) Branch of the Credit River runs for about 1640 m in an easterly direction through the Credit Forks ANSI, from a point (UTM 5796E.) just downstream of the impoundment and dam in the Belfountain Conservation Area to a point (UTM 5807E.) 300 m upstream of its confluence with the Alton Branch of the Credit River. Further downstream (between UTM 5817E. and 5823E.), 1000 m the main channel of the Credit lies within the ANSI and an additional 400 m length (between 5823E. and 5826E.) defines a section of the ANSI boundary at the northeast corner.

The overall length of the Credit River, from headwaters north and east of Orangeville to its mouth at Lake Ontario, is about 88 km (ODPD 1956). The Erin Branch originates about 2.5 km north of Hillsburgh and flows south and east about 19 km to join the main river at Credit Forks (UTM 58085E.485025N.). The gradients of the upper reaches of the Credit and of the Erin Branch are irregular as they cross a variety of glacial and post-glacial deposits. Often sections of relatively flat gradient alternate with short stretches of steep gradient, the steepest of which are associated with passage over the brow of the Niagara Escarpment.

The average gradient of the Erin Branch for the 15 km upstream of the Belfountain Conservation Area dam is 4.7 m/km (ODPD 1956). Water flow is generally quiet and the stream is impounded at several locations above and below Hillsburgh. Between the Belfountain dam and Credit Forks, the gradient of the Erin Branch is 23.8 m/km. However, despite the 5-fold increase in gradient from the average above the Belfountain dam, flow in the 400 m above the Willoughby dam (between UTM 58000E. and 58033E.) is quiet during periods of normal to low flow rates. Rapid and turbulent flow is associated with

the stretch immediately downstream of the Belfountain dam and with the 550 m stretch below the Willoughby dam. Between Credit Forks and Inglewood, the Credit River flows through the relatively uniformly sloped valley lands below the escarpment. The average gradient of this section of the main river is 5.9 m/km. Flows are moderately rapid and turbulent due to the presence of numerous gravel bars along this stretch of the river.

The drainage basin of the Erin Branch of the Credit River has an area of 104 sq.km (ODPD 1956), about 0.1% of which lies within the Credit Forks ANSI. No major tributary water courses arise within the ANSI but sidewall springs and seepage is present at various points along the escarpment slope, mostly west of UTM 5800E. (see Fig. 4 for some, but not all locations). The volume of such seepage is difficult to quantify but it is negligible compared to the volume of flow in the river.

The drainage basin of the Alton Branch of the Credit, above Credit Forks, is 221 sq.km (OPDP 1956). The section of river between Credit Forks and the east side of the ANSI represents an additional 6.5 sq.km of drainage area, mostly occurring in the valley lands north of the Credit and the slopes of the escarpment south of the river. This area was once briefly considered for a possible flood control impoundment, but was dismissed because it would flood the "most scenic part of the valley" (OPDP 1956).

Belan (1987:5.2.4) reports an average annual flow rate for the west branch of 0.880 cu. m/sec based on an extrapolation from the gauging stations at Orangeville and Cataract on the Alton Branch of the Credit. I have recently examined flow rates for the last few years at the Orangeville gauging station (Beak 1987; Canada Dept. Environment, pers. comm.). In both 1987 and 1988, flow rates have shown annual drops of about 20% from their previous yearly rates reflecting the present drought in southern Ontario. Similar reductions in the flow rate of the Erin Branch of the Credit are likely to have occurred.

The water quality along the Erin Branch within the ANSI is reported to be good by Ministry of Environment criteria, such as fecal coliform count, dissolved oxygen and phosphorous concentration (Belan 1987). However, this stretch of the Erin Branch is not productive of sport fish such as trout due, partly, to high summer water temperatures, as well as the absence of suitable habitat (D. McLeish, pers. comm.). To lower summer temperatures in the stretch below the Belfountain dam, a bottom draw outflow device has been installed at the dam (UTM 5796E.) in the Belfountain Conservation Area, immediately west of the ANSI. A drop in summer temperatures of about 2° C is anticipated for the Erin Branch below the dam, but no data were collected for 1988 or 1989 (D. McLeish, pers. comm.). In addition, the stream bed above the Willoughby dam (UTM 5803E.) is silty and provides no suitable trout spawning habitat. Below the Willoughby dam, the flow is too turbulent for spawning trout and mainly large cobbles are present in the stream.

The section of the main channel of the Credit River that lies within and on the northeast edge of the ANSI (between UTM 5817E. and 5826E.) is prime trout spawning habitat with numerous riffles and a high level of spawning activity (D. McLeish, pers. comm.). The water quality is good and numerous gravel bars and beds are present across the width of the water course. The oxygen levels are generally high and the water is well-aerated by its upstream passage over the brow of the escarpment. High oxygen levels, numerous gravel beds and moderate water temperatures are all important factors in the successful trout fishery of this area (D. McLeish, pers. comm.).

2. Springs and seepage

Water-bearing strata occur frequently in the rock formations of the Niagara Escarpment, most often in the friable, interbedded formations of the Clinton Group (Gosselin et al. 1975). This is well demonstrated in the Credit Forks ANSI where several springs and areas of seepage are present on the

south slope of the escarpment. The impervious formations of the Cataract Group, in this instance the Cabot Head Formation, intercept the groundwater moving through the strata of the Clinton Group and it appears on the slope at the locations indicated in Figure 4.

The volume of flow is modest in relation to that of the Credit River, but it is continuous and probably ranges on the order of 5 to 50 liters per minute. These springs and seeps have very significant local effects. The water exits the bedrock at a relatively cool temperature. Then, evaporation adds to the local cooling effect and contributes to the cooler-than-normal microclimate that occurs on the north-facing escarpment slope. This groundwater also indicates that sub-surface erosion and chemical weathering is occurring in the rock strata below the escarpment caprock. These are two of the several means whereby the more resistent rocks of the Amabel Formation are undermined, and eventually destabilized.

CLIMATE

The Credit Forks ANSI lies in the Huron Slopes Climatic Region (Brown et al. 1974, p.6). This crescent-shaped Region is centered on Wellington County with considerable areas of most adjacent counties. The area represents the central portion of the province's southwestern peninsula as defined by Lakes Huron, Erie and Ontario and includes the cities of Guelph and Kitchener-Waterloo. The Credit Forks ANSI lies in a relatively small wedge of the Regional Municipality of Peel that occurs in the Huron Slopes Climatic Region. To the south of that wedge is the South Slopes Climatic Region (so-named for the south slope of the Oak Ridges moraine) and to the north is the Simcoe and Kawartha Lakes Climatic Region. The growing season is somewhat shorter (195 days vs. 205 days) and cooler (3,200 growing degree-days vs. 3,500 growing degree-days) in the Credit Forks ANSI region than in the South Slopes Region. Although the precipitation values are nearly identical for the Huron Slopes Region (0.8-1.0 m) and the South Slopes Region (0.75-0.95 m), more of it falls as snow in the Credit Forks ANSI area (2.79 m vs 1.78 m; all climatic values from Brown et al. 197-).

Within the Credit Forks ANSI, a considerable extent of the escarpment slope is north-facing, so that cooler-than-normal conditions prevail in much of the ANSI north of the escarpment rim. The presence of seepage on these north-facing slopes contributes to the microclimatic differences, as does the stretch of the Erin Branch in a relatively narrow valley. Evaporation from both seeps and streams lowers ground surface temperatures during warm weather.

More normal climatic conditions appear to be present on the tablelands above the escarpment, including those of the Willoughby property. These areas receive more typical regional exposure to solar insolation and are not influenced by the evaporative cooling that occurs on the escarpment slopes in the vicinity of springs and seepage and in the valley bottoms where the branches of the Credit River are present.

VEGETATION

1. Vegetation-types and species associations

Two major schemes of regional sub-division of Ontario based on biological factors have been proposed, one by Hills (1959; 1976) and one by Rowe (1972). They are in substantive agreement in their treatment of the area in which the Credit Forks ANSI occurs. By Hills' (1976) scheme the ANSI is within ecological site region 6 and by Rowe's (1972) treatment within the Huron-Ontario Forest Section of the Great Lakes-St. Lawrence Forest Region. The characteristic expression of biological and ecological factors within Hill's site region and Rowe's Forest Region is a closed-canopy forest with particular compositional features, such as is found within most of the Credit Forks ANSI.

Closed-canopy forest, much of it nearing maturity, occupies nearly 93% (314 ha) of the Credit Forks ANSI. The composition of those forest communities provides excellent representation of the general vegetation features of ecological site region 6 (Hills 1956) and the Huron-Ontario Forest Section (Rowe 1972). The forest of the tableland is composed primarily of hardwoods (broad-leaved trees) in which sugar maple (Acer saccharum) is dominant on mesic soils and the minor elements are beech (Fagus grandifolia) and white ash (Fraxinus americana). On small knolls of drier soils, trembling aspen (Populus tremuloides) is the dominant species with white birch (Betula papyrifera) often present as a minor element. In wet depressions on poorly drained soils, red maple (Acer rubrum) is the dominant with yellow birch (Betula alleghaniensis) present as a minor element.

A mosaic of mixedwood stands (conifers and hardwoods) is present on the escarpment slopes with various dominant or co-dominant species depending upon such factors as slope aspect, soil development and moisture, and historical opportunity. On the steepest slopes white cedar (Thuja occidentalis) is dominant and white birch is a minor element. On boulder-strewn talus slopes, white birch is the dominant and white cedar is the minor element. On the gentler portions of the slope, where deeper soils are usually present, eastern hemlock (Tsuga canadensis) and sugar maple are often co-dominant with the minor elements being beech, white ash, yellow birch and basswood (Tilia americana). On drier slopes and on the terrace surrounding the CPR tracks, trembling aspen (Populus tremuloides) is a dominant with such minor elements as red ash (Fraxinus pennsylvanica) and white birch. In seepy areas and wet terrace sections, white cedar, balsam fir (Abies balsamea) and yellow birch are often nearly equally abundant.

On the outwash and weathered shale below the escarpment, valley floor forest is dominated by white cedar with trembling aspen, white birch and sugar maple as sub-dominants. Along the Credit River, bottomland forest is strongly dominated by white cedar.

A more detailed treatment of community composition and consideration of the structural aspects of these vegetation communities appears in the descriptions that follow this section.

The 314 ha of forest in the ANSI area has been classified by landform units as follows:

1) forest (314 ha; 93% of ANSI area);
   a) tableland (188 ha; 60% of the forest area);
      i) dryland (185 ha);
      ii) swamp (3 ha);
   b) slope (101 ha; 32% of the forest area);
      i) glaciofluvial and clay (82 ha);
      ii) talus (19 ha);

c) escarpment rim (1 ha; less than 1% percent);
d) terrace (9.2 ha; 3% of the forest area);
e) valley floor (7.4 ha; 2% of the forest area); and
f) bottomland (7.1 ha; 2% of the forest area).

These forest-landform units appear in the vegetation map for the area (Fig. 3), and serve as the section headings in the community descriptions below. Within each of the forest-landform units a number of species associations are found based on the most abundant tree species and those with the greatest biomass. These associations are described where they are principal constituents of the forest-types and, particularly, when they are characteristic associations of the forest-type. However, the particular associations of each forest-type have not been mapped nor has the areal extent of those species associations been quantified.

Several non-forest vegetation units have been identified and mapped (Fig. 3). Though they occupy relatively small acreages, they contribute greatly to the diversity of habitats and species within the ANSI. Equally importantly, they represent forest gaps that result in edge habitat. Both the edge habitat and forest openings are of considerable value to many species of birds and mammals that live in the forest but feed in openings, as well as attracting additional edge dwelling species. These vegetation-types are:

2) riparian (3.6 ha; 1% of the ANSI area);
3) seasonal wetlands (2.0 ha; less than 1% of the ANSI area);
4) rock or cliff face (no acreage determined); and
5) anthropogenic (20.2 ha; 6% of the ANSI area), including,
   a) transportation corridors (9.0 ha);
   b) old clearings (6.7 ha);
   c) building envelopes (4.0 ha);
   d) stream impoundment (0.5 ha).

The riparian communities occur along the banks of the Erin Branch and the main branch of the Credit River. These are compositionally diverse communities but the most common, in order of descending frequency, consist of: a) patches of grasses, mainly reed canary grass (Phalaris arundinacea); b) a mix of shrubs, mainly willows (Salix spp.), grasses, often creeping bent (Agrostis stolonifera), and diverse forbs, such as northern bugleweed (Lycopus uniflorus) and beggar-ticks (Bidens cernua); and c) forb-dominated muck flats, with spotted jewelweed (Impatiens capensis) and water parsnip (Sium suave).

Seasonal wetlands include several small pockets of swamp forest on the tableland south of the escarpment. Dominated by red maple, these areas are present in the poorly drained hollows and swales of the Paris moraine. The larger areas are identified on Figure 3. Several other small wetland pockets are sufficiently wet and mucky to preclude tree growth. These sloughs or meadows are dominated by patches of graminoids such as sedges (mainly Carex retrorsa), wool-grass (Scirpus cyperinus) and fowl manna grass (Glyceria striata). If open water persists into the latter half of the growing season, a film of duckweed (Lemna minor) is present on the surface. The edges are more or less ringed with a zone of willows (Salix spp.) and red osier (Cornus stolonifera).

The rock faces are generally open with few plants eking out a precarious existence on the narrow ledges and crevices that are present. One species that is restricted to such habitat is the rock brake (Pellaea glabella). Others that occur more widely are also characteristic of such rock face habitat and include fragile fern (Cystopteris fragilis) and wild columbine (Aquilegia canadensis).

A number of habitats and communities exist as a result of human activities and the development of lands within or bordering the ANSI. These are the anthropogenic vegetation community-types. Those of the transportation corridors are located along the roadways and the Canadian Pacific Railroad line that run

through various portions of the ANSI. This habitat is managed to prevent the growth of woody vegetation, though poison-ivy (Rhus radicans) and riverbank grape (Vitis riparia) are common along the railway right-of-way. As well, these and other shrubs are occasional along Caledon Mountain Drive, the main road through the tableland of the ANSI, and along the driveway to the Willoughby house. Typical roadside species, such as ox-eye daisy (Chrysanthemum leucanthemum), wild carrot (Daucus carota), black medic (Medicago lupulina), and Canada blue grass (Poa compressa), have a scattered distribution in all or most available roadside habitats, including the railroad right-of-way.

The old clearings in the ANSI are in transition to woody vegetation and will eventually support forest communities. At present they support patches of shrubs, particularly staghorn sumac (Rhus typhina) and brambles (mainly Rubus strigosus), with a diverse mix of grasses and forbs. Among the more common species are Canada blue grass, orchard grass (Dactylis glomerata), yellow hawkweed (Hieracium caespitosum) and tall goldenrod (Solidago altissima).

Building envelopes are typically landscaped and managed. Various exotic species of trees, shrubs and forbs are planted around the residences and in the adjacent yards and gardens. At the edge between the building envelope and the natural vegetation of the ANSI tableland is a zone where a variety of opportunistic non-native species such as ox-eyed daisy, common St. John's-wort (Hypericum perforatum) and dandelion (Taraxacum officinale) are found. Other common escapes from domestic cultivation, such as tartarian honeysuckle (Lonicera tatarica), can use such edge habitat to invade the native habitats of the tableland forest.

The community growing in the muck and mud flats created by the stream impoundment (UTM 5802E.) along the Erin Branch of the Credit River is treated as anthropogenic because its habitat has been created by the old stone dam (UTM 5803E.) on the Willoughby property. In 1988, the community was dominated by spotted jewelweed and water parsnip. However, the size and composition of that community must be considered highly variable, depending as it does on the volume of water impounded behind the stone dam and the moisture regime of the exposed sediments.

2. Floristic features

From a floristic standpoint, Credit Forks ANSI is distinctive for the presence of extensive areas of representative escarpment-related vegetation with characteristic native species in most habitats. These species are not rare or exceptional but their full development in unmodified or unaltered landscape units is becoming less and less common in the southern third of the province. Many of the dominant or more common species have been named in the preceding descriptions of community composition. The compositional features of the vegetation communities of this ANSI could well be the best extant example of the pre-settlement flora of the Dufferin Section of the Niagara Escarpment and its associated tableland. It is certainly the largest contiguous area of nearly-mature, spontaneous vegetation in the Section.

Only two species identified in the Credit Forks ANSI, Canada waterleaf (Hydrophyllum canadense) and blue-beech (Carpinus caroliniana), have southern affinities that are associated with the Carolinian floristic region of Ontario (Scoggan 1978). On the other hand, many species with relatively northern distributions are present, including balsam fir (Abies balsamea), yellow birch (Betula alleghaniensis), white cedar (Thuja occidentalis), mountain maple (Acer spicatum), running ground-pine (Lycopodium obscurum), wild sarsaparilla (Aralia nudicaulis), northern bugleweed (Lycopus uniflorus), Canada mayflower (Maianthemum canadense), and foam flower (Tiarella cordifolia), among others. Thus, the flora has a distinctly northern character which ties in with the cooler-than-normal microclimate on the extensive area of north-facing slopes in the ANSI.

Another aspect of the floristics of the ANSI is the proportion of exotic, or non-native, species identified in the local flora, in this instance about 23% of the ANSI flora (60 species out of 260). This is a proportion lower than the provincial total of 27.4% (Kaiser 1983) and suggests that communities of native species have been able to hold their own despite past and present disturbance factors.

3. Vegetation-site type matrix

The relationships between soil moisture regime, substrate types and microclimate in the above forest-landform units and other vegetation communities are graphically represented in the vegetation-site matrix of Figure 2. The various vegetation-types and plant communities are compartmentalized in a matrix that encompasses the range of microclimatic conditions, substrate types and moisture regimes that can potentially occur in a natural system. The microclimates range from cooler- to warmer-than-normal. Soil types are rock, sand, loam, clay and organic.

The moisture regime varies from arid to open water, with 8 intergradations (see Figure 2). In general, the various microclimates within the Credit Forks ANSI have been inferred from the aspect of the various landforms with reference to the resident vegetation, and not by climatic measurement.

Most sites in the Credit Forks ANSI have normal or cooler-than-normal microclimates. Only the upper section of the south-facing slope above the Erin Branch of the Credit River is considered to have a warmer-than-normal microclimate. The blue-beech is found in this area, but not the Canada waterleaf (see discussion above, on floristic affinity).

The normal microclimate is largely associated with the escarpment tableland, the terraces, and lower sections of the south-facing slopes. The cooler-than-normal conditions are mainly associated with the escarpment face, the north-facing escarpment slope, and the riparian and bottomland areas. However, the hummocky terrain of the tableland and the poorly drained wetland basins are considered to maintain cooler-than-normal conditions in the deepest of these basins. Similarly, the south-facing aspect of the north banks of the Erin Branch and the main section of the Credit River are believed to counter much of the cooling effect of cold air drainage and local evaporation. Thus, a mosaic of microclimatic conditions is superimposed on the general microclimates.

The range of substrates in the Credit Forks ANSI includes all of the possible types. Rock is present on the rim and face of the escarpment. Sand is present on sections of the banks of the Erin Branch and main branch of the Credit River. Loam is the prevalent substrate on the tableland, and is also present on some sections of the escarpment slope and the valley floor and small sections of the river banks. Clay is present on some portions of the escarpment slope, the valley floor and bottomland and small sections of the river banks. Organic substrates are present in the wetland basins on the escarpment tablelands, crevices on the escarpment rim and slope, and much of the bottomland area.

The moisture regimes in the ANSI range from very dry in the rock crevice and ledge habitats on the escarpment to open water habitats along the stream courses. Most habitats experience a range of moisture regimes that occur as a mosaic of conditions reflecting topographic relief or changes in substrate type. Dry conditions occur mostly on rocky or sandy substrates. The range of mesic conditions occur on the loamy substrates. Wetter moisture regimes are generally associated with organic substrates but are also found with sandy substrates on the banks of the Erin Branch and main branch of the Credit.

Substrate / Temp.	Moisture regime	Arid	Very Dry	Dry	Dry Mesic	Mesic	Wet Mesic	Wet	Very Wet	Saturated	Open Water
Colder	Rock		4	1b 1c 4	1c						
	Sand						2	2	2	2 5d	2 5d
	Loam				5a	5a 1b	1b				
	Clay					1e	1b 1e	1b 2	2	2	
	Organic			1c	1c	1c		1b 1f	1f	5d	5d
Normal	Rock			1c	1c						
	Sand			5a	5a	5a	2	2	2	2	
	Loam			1b	1a,b,d 5a,b,c	1a,b,d 5a,b,c 1e	1a,b,d 1e,5b	1b 2	2	2	
	Clay					1e	1e	1f			
	Organic						3	3	3	3	
Warmer	Rock										
	Sand										
	Loam										
	Clay			1b	1b	1b					
	Organic										

Figure 2 : VEGETATION - SITE MATRIX FOR CREDIT FORKS AREA OF NATURAL AND SCIENTIFIC INTEREST

1 FOREST

- a Tableland
- b Slope
- c Escarpment rim
- d Terrace
- e Valley Floor
- f Bottomland

2 RIPARIAN

3 SEASONAL WETLANDS

4 ESCARPMENT FACE

5 ANTHROPOGENIC

- a Transportation Corridor
- b Old Clearings
- c Building Envelope
- d Stream Impoundment

VEGETATION COMMUNITY DESCRIPTIONS

Environmental factors such as soil type, slope aspect and soil moisture regime create conditions that are suited to different plant species. If environmental factors are more or less uniform over a given land area or recur on particular lands in an area of climatic uniformity, identical plant communities may develop. However, plant groups rarely manifest a constant pattern of species associations since environmental and historical factors are rarely identical over large areas. Instead, species groups of general similarity often occur on similar landforms where other factors are also relatively similar. The combination of species aggregations with physiognomical and compositional similarity on landforms with similar environments has been designated a landform-vegetation unit or "landform community-type." The descriptions that follow are of these landform community-types.

1. Forest

The forests of the Credit Forks ANSI are characteristic of the landforms and their environmental factors on most of its land area. The tableland and valley floor stands are second or third-growth forests which have become established after initial logging and subsequent attempts at agricultural production ceased 50 to 70 years ago. These forests may not have been clear-cut but they are certain to have been initially logged for such desirable species as white pine. At a later stage, maple would have been cut for fuel and red oak for the furniture trade. During the period of agricultural exploitation, wooded areas would have been extensively grazed.

The slope forests are unlikely to have been exploited, but have been maintained in a young, pioneer state by natural factors such as erosion and rock slides. The forests are more or less contiguous over the entire area, interrupted only by roadways, a rail line and the natural discontinuities of the escarpment and the Erin Branch of the Credit River. Their composition reflects geological and historical disturbance factors as much as any regional environmental influences. Their floristic affinities are typical of the south-central location of the ANSI in the province.

The structural development of the forest-types is also typical of their composition and the landforms on which they occur. The tableland and terrace forests are mainly tolerant hardwoods with minor representation by conifers. The understory is patchy and heterogeneous, often with the most abundant species being saplings of the canopy species. The understory is well-developed in and around canopy gaps (glades) and forest edges. The ground cover is also patchy and heterogeneous. Numerous species are present but often as large distinctive patches (contagious distribution) rather than as uniformly distributed individuals. Patches of bare soil, both with and without a humus layer, are common in densely shaded areas. The slope, bottomland and valley floor forests are mixedwood (nearly equal representation by deciduous and conifer species) and conifer stands. The understory is highly variable but often poorly developed except in and around glades or erosion scars. It is generally absent in the conifer stands. The ground cover is also patchy but generally better developed than the understory. Contagious distribution of species is common except for the woodland ferns which are often widespread and abundant. On older boulders and talus, bryophytes constitute a major component of the ground cover.

Most of the forest appears to be in early middle age, ranging from 50 to 75 years old. These ages reflect the approximate time periods during which large acreages of marginally productive agricultural lands, particularly pasturage and grazed woodlots, were abandoned and allowed to revert to forest. Older trees are often scattered through such forest stands, having been overlooked in the periodic culling of mature trees from farm woodlots or been spared to serve as markers.

a. Tableland forest

The 188 hectares of tableland forest are distributed between two separate sections of escarpment plateau with the largest portion of it (176 ha) on the escarpment south of the Erin Branch of the Credit River and 12 ha on the escarpment finger north of the Erin Branch. There is compositional similarity between the forest stands of both these plateaus. In all of the tableland stands, sugar maple (Acer saccharum) is the principal dominant, in most areas accounting for 80–90% of the tree stems. Minor elements such as beech (Fagus grandifolia) and white ash (Fraxinus americana) are scattered and widespread through these stands. Basswood (Tilia americana) is less frequent but also widespread. White birch (Betula papyrifera) is occasional and often present in diffuse clusters, as is black cherry (Prunus serotina) and eastern hemlock (Tsuga canadensis).

The understory is patchy and often sparse in areas of continuous canopy. Generally sugar maple saplings are the most widespread and abundant element, followed by white ash saplings. Most other species occur as widely scattered individuals, such as alternate-leaved dogwood (Cornus alternifolia), prickly gooseberry (Ribes cynosbati) and red-berried elder (Sambucus pubens), or as small clusters, such as chokecherry (Prunus virginiana) and red raspberry (Rubus strigosus). The densest development of understory occurs in and around canopy gaps with brambles (Rubus spp.) and round-leaved dogwood (Cornus rugosa) often forming small thickets.

The ground cover is also patchy and heterogeneous. As mentioned, species often exhibit contagious distribution, forming large single-species patches which are widely distributed across the tableland forest. Among the more common of these are wild ginger (Asarum canadense), blue cohosh (Caulophyllum thalictroides), herb-robert (Geranium robertianum) and sweet cicely (Osmorhiza claytonii). Occasionally those patches appear limited to a single area, as is the case with Canada waterleaf (Hydrophyllum canadense). Species that are widespread and may or may not be clustered include the woodferns, particularly intermediate woodfern (Dryopteris intermedia), Canada mayflower (Maianthemum canadense), blue-stemmed goldenrod (Solidago caesia) and zig-zag goldenrod (S. flexicaulis). This forest can be expected to have an abundant spring flora but the timing of this survey has not permitted its examination. Two species of our spring flora, wild leek (Allium tricoccum) and white trillium (Trillium grandiflorum), that persist well into the growing season were observed to be widespread through the tableland forest.

b. Slope forest

The slope forest is distinguishable into two sub-units, i) areas with a glaciofluvial soil or weathered shale (clay soil) derived from the escarpment (the Clinton and Cataract Groups and the Queenston Formation) and ii) areas of accumulated talus and rock debris. These landform-vegetation units have respective areas of 82 hectares and 19 hectares. The two principal talus units occur below the escarpment exposures (Fig. 3). The western section has an area of 6 ha and the eastern unit an area of 13 ha. These are probably the most extensive talus slopes along the Dufferin Section of the escarpment.

Species composition in the slope forest is extremely variable, reflecting the considerable variability of environmental conditions on the slopes. Both north- and south-facing slopes are present. Imposed on that general distinction, the ridge and gully pattern that stretches across the face of the slopes results in many small- scale changes in slope aspect. The moisture regime is also quite variable due to springs and seepage at various places on the slopes, mostly from single points but in at least one location from numerous closely spaced sources across a section of over 100 m long (UTM 5823E., Fig. 4).

i. Glaciofluvial or clay slope forest

A mosaic of sugar maple–eastern hemlock and white cedar (Thuja occidentalis) stands occurs across the north–facing slope, fronting on Forks–of–the–Credit Road, north of the Erin Branch of the Credit River. Among other factors, depth and age of the soil on the slope may be a major determinant in the ability of species other than white cedar to become established on these slopes. Where soils are young, very shaly, and/or shallow only white cedar is present. On deeper soils, sugar maple and eastern hemlock, occasionally with scattered yellow birch (Betula alleghaniensis), is present.

A similar mosaic is present on the south–facing slope, north of the Erin Branch of the Credit, but trembling aspen (Populus tremuloides) is a significant component of the canopy. It is present around the edges of the maple–hemlock stands, appears occasionally as small groves in the white cedar stands and forms stands of its own along the lower sections of the slope.

South of the Erin Branch of the Credit, the north–facing slopes are mainly dominated by sugar maple and sugar maple–eastern hemlock stands with minor representation by various hardwoods. Trembling aspen and large–toothed aspen (Populus grandidentata) are occasionally present on the edges of the stands and particularly along the edges of the rail line terrace.

Trembling aspen is also common on some of the small slope terraces at the base of the escarpment exposures and along the lowermost edges of the slope forest. Other widespread minor elements are eastern hemlock (Tsuga canadensis), which occasionally becomes a sub–dominant, and white ash. On the wet soils associated with seepage, balsam fir (Abies balsamea) and yellow birch (Betula alleghaniensis) are often the co–dominants with white cedar. On the gentler sections of the slopes, particularly at the east end of the ANSI, sugar maple is a dominant or in some sections a co–dominant with eastern hemlock with white ash and beech as minor elements. On the slope below the northcentral terrace, sugar maple is the principal dominant and white ash is a minor constituent. Hop–hornbeam (Ostrya virginiana), basswood and black cherry are widespread but infrequent minor elements.

The understory ranges from completely absent on the steepest sections of the slopes to dense and well–developed in the vicinity of the canopy gaps around seepage streams. In such moist soils, balsam fir saplings and mountain maple (Acer spicatum) are abundant. On drier soils in and around openings and canopy gaps, the brambles (Rubus spp.) are generally abundant, particularly mountain blackberry (R. allegheniensis) and purple–flowering raspberry (R. odoratus). On the lower sections of the north–facing slopes, scattered patches of Canada yew (Taxus canadensis) are present. Across most of the slopes, the understory is moderately sparse with a scattering of many of the same species that are found in the tableland forest, such as alternate–leaved dogwood, chokecherry and red–berried elder.

The ground cover is also moderately sparse, being most distinguished by the frequency of fern clumps, particularly woodferns. Both intermediate (Dryopteris intermedia) and marginal woodfern (D. marginalis) are abundant. Spinulose woodfern (D. carthusiana) is widespread but much less common. Christmas fern (Polystichum acrostichoides) is also widespread and moderately common. Most of the forbs and grasses present on the slopes occur as scattered individuals. Infrequent but widespread across all the slopes are large–leaved aster (Aster macrophyllus), blue cohosh, Canada mayflower, hairy Solomon's seal (Polygonatum pubescens), blue–stemmed goldenrod and early meadow–rue (Thalictrum dioicum). Exceptions are the species with contagious distributions such as wild ginger (Asarum canadense), blue cohosh (Caulophyllum thalictroides) and the violets, including long–spurred violet (Viola rostrata) and downy yellow violet (V. pubescens), which occur as patches of several dozen individuals.

ii. Talus slope forest

White birch (Betula papyrifera) is a principal dominant on the talus deposits on the north-facing slope and white cedar is a minor element, occasionally forming small, dense groves. Trembling aspen (Populus tremuloides) is the most abundant species in and around the recent talus scar (UTM 5822E.) near the east end of the ANSI and other recently disturbed parts of these communities. These communities are maintained in a pioneering condition by the recurrence of rock slides due to escarpment weathering, the instability of the talus slopes and the lack of suitable plant substrates on these slopes. The understory on the talus deposits is almost non-existent, consisting mostly of scattered brambles, mainly red raspberry (Rubus strigosus), growing up between rocks in sunny openings.

The ground cover is also sparse, being most distinguished by the frequency of mosses and ferns, particularly ferns that grow on the mossy rocks of weathered talus. In such areas, intermediate woodfern (Dryopteris intermedia), marginal woodfern (D. marginalis) and common polypody (Polypodium vulgare) are abundant. On the eastern talus deposit, a large population of walking fern (Camptosorus rhizophyllus) is present. The most abundant of the forbs is herb-robert (Geranium robertianum) which is present on most mossy boulders. Bryophytes, particularly one or two species of moss, cover the upper surface and sides of many of the well-weathered boulders and provide the substrate in which such species as herb-robert, common polypody and walking fern are established. Around seeps and in seepage zones, on wet soil and rock, at least one species of liverwort (probably Conocephalum conium) is abundant.

c. Escarpment rim forest

A narrow band of rim forest is present along the top of the exposed sections of escarpment face. This community extends no more that 6-8 m back from the escarpment brow and is characterized by white cedars with a scattering of white pine and a few white birch. The pines are the most distinctive aspect of this community, for they tower above the cedars and their windswept limbs stand silhouetted against the sky.

The community is also distinctive for its patches of bare rock and shallow soil. Only a few scattered shrubs, mainly brambles (Rubus spp.), are present in this community, usually in sunny gaps in the canopy. The ground cover is more abundant though patchy. Canada blue grass (Poa compressa) and Canada mayflower (Maianthemum canadense) are the most common species. Yellow hawkweed (Hieracium caespitosum) is also abundant. Wild columbine (Aquilegia canadensis) is frequent.

d. Terrace forest

Areas of terrace forest are scattered across the slopes, but most are narrow, linear features that are only poorly distinguished from the slope forest that surrounds them. However, two areas are sufficiently large and distinctive enough to be mapped in the north-central portion of the ANSI (UTM 5814E.48506N. and 5818E.48506N., Fig. 3). These areas are dominated by sugar maple with minor representation by beech, black cherry and eastern hemlock and a scattering of white pine at their northern edges. A close examination of the understory and ground cover was not been made but it is probably similar to that of the tableland forest.

e. Valley floor forest

This area of 7.4 ha lies between the bottomland forest along the banks of the Credit River and the slope forest of the escarpment. It could also be classified as "escarpment toe" forest but the escarpment toe is a poorly defined zone that is not always well distinguished (Gosselin et al. 1975). This community is developed on the weathered glacial outwash that extends across the floor of the valley. This forest stand

is dominated by white cedar and has trembling aspen, white birch and sugar maple as sub-dominants, generally with a clumped species distribution. White ash and yellow birch are minor elements. A close examination of the understory and ground cover has not been made.

f. Bottomland forest

An area of 7.1 ha of bottomland forest is present along the main channel of the Credit River on the northeast edge of the ANSI. It has developed on a soil of organic muck produced in situ and alluvium deposited by the Credit. White cedar is the dominant species with minor contributions from white and yellow birch, white ash and balsam fir. Along much of the river course, the forest extends to the river edge. This forest is probably flooded during large spring freshets, though probably not on an annual basis. A close examination of the understory and ground cover has not been made.

2. Riparian plant communities

Two areas of riparian vegetation are present, one along the west half of the Erin Branch of the Credit River (west of the stone dam at UTM 5803E., Fig. 3) and the other along the banks of the main channel of the Credit River in the northeast corner of the ANSI. The former area is mapped and has an area of about 3.2 ha. The latter area exists as a narrow, fragmented zone along the river and has not been mapped but its area is estimated at 0.4 ha based upon an average width of 2 m on each side of the river where the river passes through the ANSI (1000 m) and on one side of the river where it forms the boundary (400 m), modified by an estimate of bottomland forest at the river edge (about 20% of the shoreline). East of the stone dam (UTM 5803E.) on the Erin Branch, the slopes stand some 2-3 m above the river and no riparian zone is present.

The riparian community includes both the river banks and the shoreline sand and gravel bars that are occasionally present. The community varies in width, disappearing from one or another bank where the slope or bottomland forest extends to the edge of the stream channel. Subjected to unpredictable flood events and the effects of ice scour during the late winter and early spring, most of the species in this community are herbaceous annuals or perennials that overwinter by means of underground storage organs such as rhizomes.

Numerous species are present in this community-type but most have scattered occurrences with only a few being widely abundant. As well the dominant species have both a contagious and mosaic distribution pattern. A stand of one species will give way to another which in turn gives way to another or the first species reappears. Linear zonation running parallel to the stream courses is poorly evident or completely absent due to the irregular topography of the stream banks. Among the dominant species of the banks and bars are creeping bent grass (Agrostis stolonifera), rice cut grass (Leersia oryzoides), beggarticks (mostly Bidens cernua, but also B. frondosa), spotted joe-pye weed (Eupatorium maculatum), reed canary grass (Phalaris arundinacea), Canada goldenrod (Solidago canadensis) and blue vervain (Verbena hastata).

With the unusually dry conditions of 1988, the majority of the mill pond on the Erin Branch of the Credit was dry and colonized by an extensive community of spotted jewelweed (Impatiens capensis) and water parsnip (Sium suave) with scattered plants of arrowhead (Sagittaria latifolia). This particular community could also be categorized as a seasonal marsh, but it is not known if the development observed in 1988 is typical (see discussion in Section 6d, below) and so this area has not been separately mapped from the riparian community-type.

Also, the few aquatic vascular plants that were encountered in the river have been assigned to this community-type (in Appendix A). They did not constitute a community in and of themselves but occurred as a few scattered plants in the shallow backwaters of the upper section of the Erin Branch.

3. Seasonal wetlands

a. Swamp (forest)

The hummocky terrain of the Paris moraine on the escarpment plateau has resulted in the creation of several small basins that are seasonally flooded and hold water due to poor internal drainage. Depending on seasonal rainfall, these basins may dry out through the summer. Five (5) such areas have been mapped (Fig. 3) with an aggregate area of about 3.5 ha. Because these areas are not easily distinguished on the aerial photographs (OMNR 1978), there is some uncertainty about the placement of the boundaries and the actual area. Also, some additional small areas may be present that are not mapped. In 4 of 5 instances, the swamps are associated with and surround a slough or meadow marsh community that occupies the wettest portion of the basin.

The principal tree species of these communities is red maple (Acer rubrum) with yellow birch as a minor component in most of the areas but trembling aspen in the westernmost. The canopies are generally dense and understory species are all but lacking. The ground cover is also quite limited with fowl manna grass (Glyceria striata) being the most frequent and abundant species. Scattered sedges (mostly Carex hystericina) are also frequent.

b. Sloughs/meadow marsh

Several seasonally flooded hollows are present in the tableland forest above the escarpment, and 5 of these sloughs, with an aggregate area of about 1 ha, are mapped (Fig. 3). These hollows are sufficiently deep and muck-lined to be flooded through a wet year, but were dry by mid-August in 1988. Vegetation is highly variable between sloughs, being dense in some and sparse in others, mainly depending upon the size of the area and the extent of shading by the surrounding tree canopy. Those that are small and ringed by forest are the most sparsely vegetated. In these only small patches of graminoids, such as sedges (mainly Carex retrorsa), wool-grass (Scirpus cyperinus) or fowl manna grass (Glyceria striata) or the forbs, spotted jewelweed (Impatiens capensis) or water parsnip (Sium suave), are present in the sunniest portions of the hollows, surrounded by a floating ring of duckweed (Lemna minor). In the larger, more densely vegetated hollows a scattered shrub component is present consisting of willows (Salix sp.) and red osier (Cornus stolonifera), among moderately dense stands of herbaceous plants that are mainly graminoids. The most common species are fowl manna grass, sedges (mainly Carex hystericina and C. retrorsa), wool-grass. The common forbs scattered through the graminoids are spotted jewelweed, and water parsnip (Sium suave). Duckweed is present on any standing water in these sloughs, often forming a complete film by the middle of the growing season, if standing water persists in the basin.

4. Rock face plants

Approximately 2.2 km of escarpment face is exposed in the central portion of the ANSI but very little habitat suitable for vascular plants occurs on these rock faces. However, there are ledges and crevices that are colonized by plants, some of which are characteristic of this habitat. Two such species that have a strong affinity for limestone outcrops and ledges are the rock brake (Pellaea glabella) and the fragile fern (Cystopteris fragilis). Though scattered across the rock face, these two species and the others, such as wild columbine, Canada blue grass and prickly gooseberry (Ribes cynosbati), that have colonized the ledges do not constitute a "plant community" of the same type and complexity as the forest communities, but can be considered pioneer communities.

On some of the wider ledges and sloping rock faces, a turf of moss is present, composed of the same species that grow on the weathered talus boulders. On the weathered and sheer rock faces, which includes most of the upper stratum of the escarpment exposure (i.e. the Amabel Formation), a good development of crustose lichens is present including species that are yellow, orange and grey.

5. Anthropogenic plant communities

Vegetation communities or species aggregations that occur on lands regularly and intensively subjected to human management are designated anthropogenic communities. They are frequently characterized by a group of species that are well-adapted to colonizing cleared lands where some kind of periodic disturbance recurs at short intervals and reduces or eliminates shading from trees. Mowing or herbicide treatments are common regimes of such areas which include roadways, railroad rights-of-way, and lawn and garden edges (the lawns and gardens themselves being excluded from consideration as most of the lawn and garden plants are planted). Included in the anthropogenic category are a variety of areas where human industry was once practiced but has been abandoned for the present. Such areas are often intermediate between anthropogenic and "stable" natural communities and are considered to be in a process of reversion to some type of forest community through a process designated "succession." These successional areas are grouped here because they support many plant species associated either with agriculture or human disturbance or both.

a. Transportation corridor communities

With more than 2 km of paved or gravel roadways and just under 2 km of railway line through the ANSI, the extent of these communities is considerable though vegetation occupies only about 20-25% of the 9.0 ha estimated for the community- type. Vegetation management activities are most intensive along the western third of Caledon Mountain Drive, along some residential driveways and within the CPR right-of-way. They are less intensive on the eastern portion of Caledon Mountain Drive and along most driveways. In the latter areas, the naturally occurring spontaneous forest vegetation grows right to the edge of the transportation corridor where it mixes with various "roadside" species such as orchard grass (Dactylis glomerata), black medic (Medicago lupulina) and white clover (Trifolium repens). In the former areas, verges of herbaceous or shrubby plants are maintained along the corridors, either by mowing or herbicide spraying or both.

Communities generally consist of a mosaic of species that recur sporadically, depending upon conditions of soil moisture and insolation. Along the CPR right-of-way, moist areas support stands of common horsetail (Equisetum arvense) with a variety of graminoids such as sedges (Carex vulpinoidea and C. flava), rushes (Juncus dudleyi) and bulrush (Scirpus atrovirens). In mesic soils, brambles (mostly Rubus strigosus) and various grasses such as orchard grass (Dactylis glomerata), meadow fescue (Festuca pratensis) and Kentucky blue grass (Poa pratensis) are dominant. On the drier sections, staghorn sumac (Rhus typhina) and Canada blue grass (Poa compressa) are dominant among a variety of forbs such as spreading dogbane (Apocynum androsaemifolium), ox-eye daisy (Chrysanthemum leucanthemum), Canada thistle (Cirsium arvense), wild carrot (Daucus carota), white sweet clover (Medicago alba), and common mullein (Verbascum thapsus).

Along the roadsides, grasses are the most common species including the blue grasses (both Canada and Kentucky), orchard grass and timothy (Phleum pratense) and the shrubs, chokecherry (Prunus virginiana) and, in a few large patches, staghorn sumac. Many other roadside herbs such as yarrow (Achillea millefolium), viper's bugloss (Echium vulgare), common St. John's-wort (Hypericum perforatum), ribwort (Plantago lanceolata) and bladder campion (Silene vulgaris) make an irregular appearance along the main roadway and the railroad right-of-way.

b. Old clearings

Four former clearings within the ANSI are presently reverting to forest vegetation. The one in the northwest corner, along the road to the Willoughby residence, has been identified as the site of former agricultural efforts (Belan 1987), but the previous uses of the others are not particularly evident. Of those on the escarpment tableland, the two central areas may have been the sites of intensive tree cutting with some agricultural use attempted in the easternmost, while the other two may have been intended for residential use after logging.

Regardless of their past histories, all of these areas now support patches of shrubs, particularly clumps of staghorn sumac, and forb-rich grasslands (e.g. Canada blue grass, orchard grass, timothy, yellow hawkweed (Hieracium caespitosum), common St. John's-wort and tall goldenrod, Solidago altissima) with scattered trees or clumps of trees, the invading species differing in each area. From east to west the most common species are: white ash and sugar maple; sugar maple and white cedar; white birch and trembling aspen with some white ash; and sugar maple and white ash.

c. Building envelope communities

Residences continue to be built within the Credit Forks ANSI, in the vicinity of Caledon Mountain Drive. Of course, where a building is situated, forest is removed to a distance of 8-15 m from the building walls. The building envelops themselves have been excluded from the ANSI but their edges constitute a gap in the forest canopy where a variety of colonizing species can become established and maintain small or large populations. These areas have not been specifically examined but are mentioned here because they do represent a habitat with the potential to make a substantial contribution to factors affecting the spontaneous vegetation of the Credit Forks ANSI. In the sites that can be seen from Caledon Mountain Drive, the effects of residential building appear to be minimal upon adjacent forest. However, such areas frequently serve as the source of exotic species introductions to natural communities when the non-native plants used for landscaping disperse their propagules into the adjacent forest. Among those that tend to be aggressive are the Norway maple (Acer platanoides) and tartarian honeysuckle (Lonicera tatarica).

d. Stream impoundment community

The characterization of this vegetation community as anthropogenic is arbitrary, but is based upon the fact that it would not be present here if the stone dam (UTM 5803E.) did not exist. The composition of this community, mainly spotted jewelweed and water parsnip, may have been atypical in 1988, due to an unusually dry summer, or it may signify the terrestrialization to the impoundment due to altered drainage from and through the dam. Aerial photography from 1978 (OMNR 1978) shows an open water area of at least 0.5 ha behind the dam whereas in 1988 only a stream channel of 8-10 m width was present. The dam presently drains from the bottom and this may mark a change from its previous condition, a change tied in with other efforts to lower water temperatures along this stretch of the Erin Branch of the Credit and thereby improve the water quality for trout both here and downstream in the main channel.

FAUNA OF THE CREDIT FORKS ANSI

Observations of animals made during the course of this study were incidental to the primary purpose of characterizing and describing the vegetation, its species associations, and preparing a relatively complete inventory of plants with particular attention to rare or unusual species. Nonetheless, a number of resident animals were encountered, with members of some species, such as the black-capped chickadee and blue jay, in evidence on nearly every visit. The complete list of observed animal species appears in Appendix A, Section 2, with a record of the identifying signs if the animals were not actually seen. Additional records from other literature or personal communications are tabulated in Appendix A, Section 3.

1. Fish

Brook trout (Salvelinus fontinalis) are present in the section of the Erin Branch of the Credit River that lies within the ANSI and Ministry of Natural Resources staff has observed several trout spawning nests (redds) above the bridge across Forks-of-the-Credit Road (D. McLeish, pers. comm.). Martin (1982) electro-fished a short section of the river upstream from the bridge to sample the resident population of minnows. Brook trout was the only sport fish caught. The five other species caught by Martin (Appendix A, Section 3) are typical for the upper reaches of the Credit (cf. Gould 1984).

This section of the Erin Branch is considered sub-optimal for sport fish spawning and as a nursery area, due to high summer water temperatures and lack of suitable gravel in the river. However, the remedial work at the Belfountain Conservation Area (see Physical Setting, above) should lower summer water temperatures and improve conditions for trout here and downstream in the main channel (D. McLeish, pers. comm.).

The section of the main channel of the Credit within the ANSI has excellent spawning and nursery habitat for both brook and brown (Salmo trutta) trout and a great deal of activity has been observed during the annual trout spawning surveys. During a 1987 creel census, 365 brown, 50 brook and 20 rainbow trout were caught in the stretch of river downstream of the Credit forks (D. McLeish, pers. comm.). No survey of the minnows and forage fish has been made in this section of the river but the species reported by Gould (1984) from Credit Forks Provincial Park can be expected here, including dace (Rhinichthys spp.), creek chub (Semotilus atromaculatus), pumpkinseed (Lepomis gibbosus), darters (Etheostoma spp.) and sculpin (Cottus spp.).

2. Herptiles

The two species of frogs seen in the ANSI were in their characteristic habitats. The northern leopard frog (Rana pipiens) was on the bank of the Erin Branch of the Credit, west of the dam at UTM 5803E. The wood frog (R. sylvatica) was in an eastern hemlock-sugar maple-yellow birch stand of the slope forest. Both species are common throughout the southern half of the province. Frogs are not wide-ranging and these species are considered to maintain resident populations in the area. The presence of other species is best determined during the breeding season in late May and early June, when males can be readily identified by their mating calls, even if they remain unseen.

Catling (in litt. 1989) reports that in the early 1960's pickerel frogs (Rana palustris) were abundant around the Forks-of-the-Credit. This species was not observed by me in 1988 and its present status in the area is not known.

3. Birds

Most of the birds observed within the ANSI were seen on several visits, indicating that they are local residents. These include ruffed grouse, red-tailed hawk, eastern pewee, blue jay, black-capped chickadee, American robin, American goldfinch and song sparrow, among others. No evidence of breeding or nesting was collected but the birds identified are species that are common breeders across southern Ontario and most or all of them probably nest within the ANSI (Appendix A, Section 2). In the early 1960's, Catling (in litt. 1989) observed turkey vulture nests on the escarpment ledges within the ANSI but no nests were seen during the present work.

Unfortunately, the Credit Forks ANSI lies on the boundaries of three of the survey squares used in the breeding bird atlas project (Piet Van Dyken, pers. comm.) and it appears that no work for that project was done within the ANSI boundaries. Gould (1984) reports an additional 40 species from Credit Forks Provincial Park (see Appendix A, Section 3) and many of the forest, woodland and cliff dwellers can be expected within the ANSI. Among these are the common flicker, downy woodpecker, eastern phoebe, tree swallow, gray catbird, red-eyed vireo, yellow warbler, northern oriole, brown-headed cowbird, and northern cardinal.

4. Mammals

Only five species of mammals have been confirmed within the ANSI (Appendix A, Section 2) but a visit at a time of light snow cover (11 January 1989) revealed a very high level of small and medium-sized mammal activity. Tracks of canids (fox or coyote or feral or domestic dog), lagomorphs (hare or rabbit) and small rodents (mice or voles) crisscrossed some sections of the slopes. Tracks of some weasel species may also have been present. Only the tracks of the long-tailed mice (Peromyscus spp.) were sufficiently well-known to me to confirm their identity. Gould (1984) reported white-footed mouse (Peromyscus leucopus) at Credit Forks Provincial Park. Several sets of tracks led to small (20-30 cm high and 15-20 cm wide at the bottom) crevice caves at the base of the escarpment cliffs and those are likely to provide excellent denning sites for such species as porcupine or fox or coyote. Also, the large angular boulders and talus on sections of the slopes provide numerous potential den sites for mice, voles and chipmunks. All of the confirmed species are common residents of the southern half of the province, although the porcupine (Erethizon dorsatum) is approaching the southern limit of its range in Ontario (Banfield 1974).

EVALUATION OF THE CREDIT FORKS ANSI

1) Representation

Located on one of the most striking escarpment exposures along the Dufferin Section of the Niagara Escarpment, the Credit Forks ANSI provides representation of some of the most characteristic physical and biological features associated with this section of the Escarpment. Escarpment tableland, brow, face and slope features are all well represented, as are features of the re-entrant valley in which the Erin Branch of the Credit River and Forks-of-the-Credit Road traverse the escarpment slope. Over thirty years ago, the authors of the Credit Valley Conservation Report observed that "no...points along the [Dufferin Section of the escarpment] can rival the area about Forks of the Credit for scenic quality....Every autumn...the fiery red, orange, and yellow blaze of the deciduous trees, sharply contrasted with isolated gleaming birch trunks and the sombre green hues of adjacent conifer stands is set forth on an imposing framework of rugged gray limestone cliffs and crumbling red sandstones [sic] interwoved with sparkling streams and picturesque waterfalls. Here nature presents one of the finest spectacles in all of south central Ontario" (ODPD 1956). The dramatic beauty of the area is nearly as unimpaired as it was in 1956.

Dramatic vistas are present from the tableland of the escarpment finger (at UTM 5805E.48500N.) towards the main stretch of the escarpment, providing views of the slope and face and the valley floor. From the escarpment brow the view encompasses the escarpment finger slope and plateau and the valley floor. Finally, from the valley floor views of the slopes and cliff faces above create a dramatically rugged landscape. The cliffs and deeply incised terrain of this area, clothed in naturally occurring vegetation characteristic of this south-central region of the province, has few equals in southern Ontario.

Two geological features may be the best examples of their kind on the Dufferin Section of the Escarpment, the large recent rock slide and the large, weathered mid-slope talus deposit between UTM 5814E. and 5824E. (Fig. 4). The rock slide (UTM 5822E.48505N.) may be the largest recent collapse, not associated with a water course, on this section of the escarpment. This area of yellow and orange-pink cliff face and angular boulders contrasts vividly with the gray, weathered cliffs on either side and the weathered boulders elsewhere on the slope. The old slide at UTM 5816E.48505N. provides a classic example of vegetation "reclaiming" a talus deposit. Numerous weathered and moss-covered boulders are piled upon one another, halfway up the slope. Trees are rooted in the crevices between boulders and are approaching full maturity. Considerable seepage is associated with this talus deposit, providing evidence of the cause of these on-going collapses. The seepage is a physical factor of some interest in and of itself, distinguishing certain strata of the escarpment and providing clues to their characteristics.

Another geological feature, the tableland south of the escarpment brow has been identified as a regionally significant earth science ANSI for its characteristic display of features of the Paris moraine, including its hummocky topography and numerous glacial erratics (Cowell & Woerns 1976:144).

The forest development and composition is typical of this portion of southern Ontario lying between Lakes Huron and Ontario. The forests of the ANSI manifest few of the effects of the early logging and pioneer industries that once spread across the Credit Forks area (Brown 1986; Belan 1987). Excellent representation of several forest community-types, including tableland, escarpment rim, slope terrace and talus, is present here, but altogether lacking in the nearby Credit Forks Provincial Park (Gould 1984). Indeed, similarly extensive, mature escarpment forest is not found elsewhere in ecological site district 6-7, except in the Mono Cliffs area some 30 km to the north (OMNR 1976; Lindsay 1984). At Mono Cliffs Provincial Park, only a limited extent of escarpment tableland forest is present, except on the

escarpment outliers. The representation of tableland forest at Credit Forks is the largest and maturest contiguous acreage along the Dufferin Section.

The slope forest communities are generally younger than the tableland forest but this is typically so, in response to the high level of natural disturbance associated with a rocky slope. Because of the hazard posed by the steep slopes of the escarpment, slope forest is common in the local region and good examples are present in Credit Forks Provincial Park (Gould 1984). However, those at Credit Forks ANSI are as well- developed and representative of pre-settlement conditions as any in site district 6-7. They include high quality examples of talus and terrace forest, landform types that are lacking elsewhere in the local area, and the areal extent of talus forest is unequalled elsewhere in the Dufferin Section of the Niagara Escarpment.

The largest forest association, sugar maple-beech-white ash, is a characteristic species association of the Huron-Ontario Forest Section (Rowe 1972). Similarly, the sugar maple-eastern hemlock association of some of the north-facing slopes, the white birch-white cedar association of the talus, and the white cedar stands of steep, shaly slopes are typical of both this Forest Section (Rowe 1972) and the Dufferin Section of the Niagara Escarpment.

2) Diversity

The diversity of landforms and the environmental variations across those landforms within the Credit Forks ANSI is reflected in the variety of vegetation community-types present and the numerous species associations present in each community-type (see discussion in Vegetation Community Descriptions, above). This heterogeneity is particularly apparent across the face of the slopes and the complexity of the vegetation mosaic has been simplified in the vegetation map to bring out its salient features rather than obscure them (Fig. 3). The slope vegetation includes pockets of wetland communities on seeps and around side slope springs and streams, including shrub thickets of willow and red osier (Salix spp. and Cornus stolonifera) and forb-rich glades with sedges (particularly Carex vulpinoidea), jewelweed (Impatiens capensis), willow-herb (Epilobium parviflorum), and spotted joe-pye weed (Eupatorium maculatum), among others; rock-colonizing and pioneer communities on talus boulders and on raw clay and shale, including lichen and moss communities with such vascular plants as common polypody (Polypodium vulgare) and herb-robert (Geranium robertianum); and a variety of forest associations including pioneer types with trembling aspen-white birch, wet soil types with white cedar-balsam fir-yellow birch and willow-black ash, mesic soil associations including sugar maple-white ash-basswood and sugar maple-white ash-hop hornbeam on mature soil pockets, on terraces of varying widths and on the foot of the slope. The diversity of natural communities in this ANSI is as high as or higher than in any other natural area in ecological site district 6-7.

The 1988 inventory of the resident biota of the Credit Forks ANSI (see Appendix A) identified 260 species of vascular plants, 2 species of amphibians, 19 species of birds and 5 species of mammals as resident or utilizing the ANSI. As well, several reliable literature reports and records are also available (Kaiser, 1976 collections; Lindsay 1976; Martin 1982; see Appendix A3, below). These reports add 12 species of plants, including four that are significant (see discussion below), 6 species of fish and 1 species of amphibian. The more extensive work at Forks of the Credit Provincial Park (Gould 1984) identifies an additional 40 species of birds that are resident in the general area, many of which can be expected at Credit Forks ANSI (see Appendix A, Section 3). Among the plants of the 1988 survey, 23 species are trees; 24 species are shrubs, small trees or vines; 18 species are ferns or their allies; 44 species are graminoids; and 151 species are forbs. The total including literature reports is 272 species.

Additions to the inventory listings are certain to occur. The present survey did not examine the spring flora, did not sample all of the area of the ANSI, and did not concentrate on the fauna. Gould (1984)

reported 408 vascular plant species from the nearby Credit Forks Provincial Park, including 192 species not found in the ANSI. While some habitats such as open fields and west-facing slopes found in the park are not present in the ANSI, a number of the species occurring in the park are likely to be present in the ANSI. Gould (1984) also reported 40 species of birds not observed in the ANSI (identified in Appendix A3, herein), as well as one additional species of amphibian, 2 species of snakes, 5 additional species of fish, and 10 additional species of mammals. Most, if not all of these species, are likely to be present in the ANSI, where suitable habitat is present.

3) Condition

The Credit Forks ANSI includes large areas of relatively inaccessible lands, particularly slopes. These areas are generally unaffected by present human disturbance. The tablelands are the areas most suited to development and the areas where most past and present development has occurred. Despite this, the general unsuitability of the lands for agriculture and the absence of any recently active local resource-based industry has allowed the development of tableland forest to proceed without serious disturbance over most of the area of the plateaus. Large acreages of the tablelands were owned by individuals with no past inclinations to develop the lands or exploit the natural resources. This has permitted forest maturation to proceed uninterrupted over a period of some 50-75 years on most of the tableland within the ANSI.

Development that presently impacts the natural vegetation mostly dates from the past 15-20 years and has been limited to the construction of residences in woodland settings along the west half of Caledon Mountain Drive (Fig. 6). The construction of individual houses continues, each residence involving the clearing of some 0.2 ha or more of tableland forest. To date at least 18 houses have been built within the ANSI, and the largest, such as the former Willoughby residence, have involved the removal of 0.5-0.6 ha of tableland forest. However, the building envelope acreages alone constitute a minor loss of tableland forest when compared with what presently remains. It is the homeowner's on-going impact that poses the most significant potential for long-term negative impacts to the natural condition of the vegetation, as a result of the management of the vegetation surrounding their houses. The introduction of exotic species has been briefly discussed in the section on building envelopes in Vegetation Community Descriptions, above. The spread of such exotics can be hastened by a management regime that alters existing species relationships and balances.

Nonetheless, present human disturbances are quite local and of low intensity. The acquisition of 39 ha of the ANSI lands by the Ontario Heritage Foundation and the negotiation of 18 landowner stewardship agreements affecting about 172 ha (51%) of the ANSI area are very positive indications that appropriate stewardship of the natural features of this ANSI will perpetuate the biological and ecological conditions in a relatively unaffected state.

4) Ecological considerations

The rugged terrain and hazardous slopes associated with the Niagara Escarpment in Credit Forks ANSI have served as a hinderance to exploitation of its local natural resources and its development for other human uses. The area has thus been able to serve as productive wildlife habitat and as a source of native plant species for a considerable length of time during the agricultural utilization of much of the dry, flat lands in the local region. The 75-80 years during which the oldest of these forest stands have persisted make them among the most mature of any in Peel Region (OMNR 1979; Webber, pers. comm.).

Because of the rock exposure and the talus deposits downslope, several specialized habitats are present here that occur nowhere else in Peel Region (Webber 1984) or Maple District (OMNR 1983) and only at Mono Cliffs in ecological site district 6-7 (OMNR 1976; Lindsay 1984). These habitats support a number of vascular plant species not found elsewhere in Peel Region (Webber 1984), that are generally scarce or of restricted distribution across Ontario (see discussion, below).

The considerable slope forest of this area serves the critical function of stabilizing the slopes and slowing the rate of erosion. To that end, the tableland forest at the escarpment brow also intercepts some run-off that would otherwise make its way downslope and exacerbate the erosion problem. On the other hand, the valley wall seepage and spring discharge that occurs at various places along the slopes accelerates the erosion rate, although discharge rates appear to be low. The seepage also has environmental significance for the biological communities on the slopes. It provides drinking water for resident wildlife and a source of ground water for plants in the vicinity of the seepage. It also has physical effects that benefit the biota. For instance, in hot, calm weather, it serves to cool the microclimate within the adjacent vegetation canopy and elevates the humidity. This lowers the rate of water loss from plants and the summer cooling benefits small animals.

The Erin Branch of the Credit River flows through the ANSI but there is no special biological significance attached to this beyond the additional habitats created for plants and animals and the utility of flowing water for certain animals. The Erin Branch has been deemed to have little suitable spawning habitat for the trout populations resident in the upper reaches of the Credit River (D. McLeish, pers. comm.). However, the Erin Branch makes a substantial contribution to the volume of the Credit River, about 32% of the flow at Credit Forks, and action has been taken to lower the summer water temperature of the Erin Branch before its confluence with the Alton branch (see Physical Setting, above). Although the effect of the work at Belfountain Conservation Area has not yet been assessed, lower summer water temperatures are anticipated (D. McLeish, pers. comm.). This may promote some trout spawning on the Erin Branch but the primary intent of this work is to improve conditions in the main channel, downstream of the confluence.

The stretch of the Credit River downstream of the Credit Forks confluence is prime trout spawning habitat, with numerous redds counted during surveys along the river (D. McLeish, pers. comm.). This area contains both excellent spawning grounds and suitable nursery habitat for the resident brook and brown trout populations and is considered significant to the sport fishery of this section of the Credit. It is the most heavily fished section of the river for trout and has been recently monitored by the Ministry of Natural Resources (D. McLeish, pers. comm.). In its fisheries planning, the Ministry of Natural Resources has assigned a top priority to the protection of fisheries habitat in stream headwaters (OMNR 1988) and this one of the most important stretches of the Credit River.

5) Special features (see Figure 4)

a. Sites or Communities

i. The Niagara Escarpment

A description of the features of the Niagara Escarpment has been provided in the chapter on Physical Setting. It is the presence of the escarpment exposures, talus slopes, and rugged terrain of the re-entrant valley that are the primary features of this area. The cliff faces and the steep slopes of the escarpment and re-entrant valley are highly significant and extremely sensitive features from a physiographic perspective. The escarpment face and talus deposits also support a variety of plant communities and species that are absent elsewhere in Peel Region and restricted in their southern

Ontario distribution to the Niagara Escarpment or other limestone cliffs and bluffs. The development of mature slope and brow forest and the presence of large acreages of talus forest further enhances the significance and aesthetic value of these escarpment features. These forest communities capture the pre-settlement, pre-development appearance of this outstanding natural feature in southern Ontario.

ii. Talus forest and pioneer communities

The vegetation of the talus deposits on the slopes below the escarpment are the most unusual plant communities of ANSI, unmatched in extent or development elsewhere along the Dufferin Section of the Niagara Escarpment. In these areas, a whole range of successional plant communities on bare rock are present. Lichens and mosses begin the process of colonization. Ferns and vascular plants get established once there is sufficient build-up of organic material to trap and hold enough water through the growing season and supply certain essential nutrients. Finally, a group of pioneering tree species colonizes the developing soils. Of course, the actual situation is far more complex, since soil pockets are present between the talus boulders, but this only enhances the diversity of developmental pathways, as does the presence of seepage and springs.

iii. Tableland forest south of the escarpment

The forest south of the escarpment rim is the most extensive acreage of continuous tableland forest along the Dufferin Section of the Niagara Escarpment. It is the only section of forested till of the Paris moraine within the Niagara Escarpment Planning Area and probably the most extensive tableland forest tract in Peel Region (J. Webber, pers. comm.). It is characteristic of the forest that once covered much of the uplands of south-central Ontario. Among its most valuable attributes are its size and compact shape both of which promote the development of forest interior habitat. Equally valuable is its relatively homogeneous development and large populations of native biota, aspects of our natural landscapes that are becoming increasingly scarce.

This area provides a valuable reserve for species that depend upon extensive forest cover, a habitat that exists in very few places south of the Credit Forks ANSI. Biogeographic research has demonstrated that species numbers are directly correlated with nature reserve size and that species requiring large forest tracts are those most in need of conservation (Diamond & May 1981).

iv. The main channel of the Credit River

The section of the Credit River at the northeast corner of the Credit Forks ANSI is highly valued habitat for the sport fishery of the upper reaches of the Credit River, providing both spawning and nursery habitat for trout. Ecologistics Ltd. (1979) identified this and adjacent sections of the Credit are the most heavily fly-fished in the entire watershed. It is part of a stretch of the upper Credit River between Cataract and Cheltenham that is considered to be the most valuable sport fishing area in northern Peel Region (D. McLeish, pers. comm.). The Maple District fisheries plan has made the protection of fisheries habitat in the Upper Credit River one of its top priorities (OMNR 1988).

In a 1987 creel census, in the stretch of river downstream of the Dominion Street bridge, an estimated 2000 person-hours were spent angling for trout. During that period, 365 brown trout were caught, of which 110 were kept. Also, 50 brook and 20 rainbow trout were caught, of which total 22 were kept (McLeish, pers. comm.).

The presence of a large, rapidly flowing water course also contributes greatly to the aesthetic qualities of the ANSI. Both visual and auditory stimulation are provided, contributing to the "natural" and rural values of this landscape.

b. Rare and unusual species

i. Plants

Two provincially rare species, ginseng (Panax quinquefolium) and hart's tongue fern (Phyllitis scolopendrium), have been reported from the Credit Forks ANSI. In the mid-1960's, a few plants of the hart's tongue fern were seen in the vicinity of the west-central escarpment exposure (Catling in litt. 1989; see Fig. 4). Ginseng was identified by Lindsay (1976, in litt. 1989) in the tableland forest south of the escarpment. No plants of either species were found during this survey although suitable habitat is present for both in the ANSI.

Table 1. Provincially (P) or regionally (RE) rare plant species in the Credit Forks ANSI.

(RE) Asplenium trichomanes — maidenhair spleenwort
Collected by P.M. Catling in 1965 & 1966; restricted in Peel to the escarpment outcrops between Cheltenham and Belfountain (Webber, pers. comm.); of limited occurrence in MNR Central Region, being rare in Simcoe and Waterloo (Riley 1988).

(RE) A. viride — green spleenwort
Collected by Kaiser in 1976; restricted in Peel to the talus deposits in Credit Forks ANSI (Webber, pers. comm.); rare in MNR Central Region, except in the Wellington-Dufferin area.

(RE) Camptosorus rhizophyllus — walking fern
Collected by Kaiser in 1976; observed in 1988; restricted in Peel to talus deposits between Cheltenham and Belfountain (Webber, pers. comm.); associated with the escarpment and limestone bluffs elsewhere in MNR Central Region but more widespread, particularly in Halton.

(RE) Pellaea glabella — smooth cliff brake
Collected by Kaiser in 1988; restricted in Peel to the cliff face at Credit Forks ANSI (Webber, pers. comm.); similarly restricted though locally abundant in Halton, Niagara, and Dufferin; rare in Simcoe and Waterloo (Riley 1988).

(P) Phyllitis scolopendrium — hart's tongue fern
Reported by Catling (in litt. 1989); collected in Peel below the Escarpment at Cheltenham; similarly restricted and rare in Halton, Simcoe, Dufferin & Wellington.

(RE) Callitriche verna — water starwort
Collected by Kaiser in 1988; only previous collection in Peel was in the Credit River in 1959 (Webber 1984); rare in Simcoe, Waterloo, and Niagara-Haldimand; unknown elsewhere in MNR Central Region (Riley 1988).

(P) Panax quinquefolium — ginseng
Collected by Lindsay in 1976; this provincially rare species is sparse but widespread in northern Peel (Webber, pers. comm.); also sparse but widespread in MNR Central Region.

(RE) Satureja acinos — mother-of-thyme
Collected by Kaiser in 1988; this introduced species is previously unknown from Peel Region (Webber 1984); known from Simcoe, Waterloo, Wellington-Dufferin, and York (Riley 1988).

Including the provincially rare species, the species cited below are all rare in Peel Region, being restricted in to the local vicinity of the ANSI, in some cases occurring only within its boundaries. The assessment below is based on the work by Webber (1984; pers. comm.) with reference to the synthesis of local floras within the ministry's Central Administrative Region by Riley (1988).

Introduced species such as mother-of-thyme are not accorded any special status despite their local or regional rarity. Their populations are often subject to considerable fluctuations and their spread is often aided by human activities. Mother-of-thyme was found in an anthropogenic habitat, a gravel roadway which is itself subject to frequent disturbance by vehicles and periodic management such as plowing for snow removal or re-grading, as well as periodic re-surfacing.

6) Site sensitivities

As a natural area representing physical and biological features in a condition relatively unaffected by human activities, all of the biological elements and some of the physical features have at least a moderate sensitivity to land development in and adjacent to the ANSI. Presently surrounded by abandoned farmlands that are actively being converted to residential housing, the lands of the Credit Forks ANSI will be looked upon as ripe for similar development. This is particularly true of the flat land areas such as the tableland south of the escarpment, the large slope terrace north of the railway line and the valley floor east of that terrace.

The sensitivities of the landforms and vegetation communities to development impacts are tabulated below (Table 2) and are mapped on Figure 5. Landform sensitivities range from "low" for the tableland and valley floor to "high" for the steepest sections of the slopes and organic bottomland terrain. The sensitivities of the vegetation communities range from "moderate" for the tableland, terrace and valley floor forest to "high" for the slope and talus forests and the wetland communities.

For mapping purposes (Fig. 5), the generally higher sensitivity of the vegetation communities has been taken as governing the development sensitivity of one or another site. Landforms generally persist after development to residential use, but biological communities are inevitably altered, usually to their detriment.

Table 2. Landform and vegetation community sensitivities in Credit Forks ANSI

LANDFORM	SENSITIVITY
Tableland	low
Escarpment face	low
Slopes	
Glaciofluvial soils	moderate
Talus	high
Terrace	moderate/high
Valley floor	low
Bottomland	high
Stream banks	high
Wetland basins	high
COMMUNITY	
Forest	
Tableland	moderate
Slope	high
Escarpment rim	high
Terrace	moderate
Valley floor	moderate
Bottomland	high
Riparian	moderate/high
Seasonal wetland	
Swamp	high
Slough	extreme
Escarpment face	moderate

PLANNING STATUS

Credit Forks ANSI occupies parts of Lots 6 to 9 in Concession 3W, parts of Lots 6 to 10 in Concession 4W and parts of Lots 9 and 10 in Concession 5W of the Township of Caledon, now the Municipal Town of Caledon.

1. Municipal Official Plan Designations

The ANSI has not been accorded any special designation by the Town of Caledon (Caledon 1979). Land use designations in and around the ANSI presently recognize the current or anticipated land uses:

a) "Agricultural Areas" on about 10% of the area;
b) "Rural Areas" on about 40% of the area; and
c) "Hazard Lands" on about 50% of the area.

The agricultural designation is probably a holdover from earlier zoning designations for no agriculture is practiced on the designated lands. The designation is applied to the Willoughby property and two small areas of land along Caledon Mountain Drive. Residential estates now occupy parts of these lands.

Most of the tableland is designated rural, a designation that permits a wide variety of relatively low intensity developments without restricting an area to one or another land use (C. Saunders, pers. comm.). Estate development is a common land use in rurally designated areas. The rural designation is also applied to the large slope terrace in the northcentral portion of the ANSI and small section in the eastern corner.

The face and slopes of the escarpment below the rim and within the re-entrant valley, as well as the valley and bottomland at the east end of the ANSI, have a planning designation of Hazard Lands, recognizing the fact that erosion, slope instability and flooding are significant threats to development on these lands.

The Town of Caledon is currently preparing for an Official Plan review and revision in 1989 (C. Saunders, pers. comm.). In that process, an attempt will be made to achieve conformity between the municipal plan and the Niagara Escarpment Plan, both with respect to land use boundaries and the type of planning designations.

2. Conservation Authority Recognition

The Credit Valley Conservation Authority has not given the ANSI any special recognition, but relies on its environmentally significant area (ESA) designations for its land use planning. The Credit Forks ANSI lies in two of the ESA's identified within the Credit River watershed, Credit Forks - Devils Pulpit and Credit Forks Forest (Ecologistics 1979). About 95% of the ANSI is in the former area, ESA #30. The latter area, ESA #31, includes the lands north of the CPR right-of-way, from the north central slope terrace eastward. The Conservation Authority's ESA policy is to attempt to preserve and protect significant physical, hydrological and biological features (M. Bracken, pers. comm.). Development that adversely affects the significant features of an ESA is discouraged and recognition of ESA boundaries and policy by the member municipalities of the Conservation Authority is encouraged.

The western portion of the Credit Forks ANSI includes about 4.2 ha that lie within the Belfountain

Conservation Area, owned by the Conservation Authority. In the master plan for the Conservation Area, these lands are designated "natural area" with proposed management policies that are appropriate to an area identified as an ESA and an ANSI (Credit Valley Conservation Authority 1984).

3. Niagara Escarpment Plan Designations

About 96% of the ANSI is within the Niagara Escarpment Planning Area (NEPA). The exception is an area of the tableland along the southwest boundary, west of 3rd Line West (Niagara Escarpment Commission 1982). Of the lands in the NEPA, most of the ANSI area has been designated Escarpment Natural Area, the most restrictive designation category of the Plan. The two exceptions to the above designation are 1) the land south of Caledon Mountain Dr. is in the Escarpment Protection Area and 2) the land south of Caledon Mountain Dr. and north of Maple Meadow Court is in the Escarpment Rural Area. Both categories prohibit major developments, but they do permit low-intensity development, subject to a review on a case by case basis. Among the most frequent developments that are approved are residential buildings and associated amenities, such as home extensions and tennis courts.

4. Land Ownership

Based on 1987 assessment rolls, land ownership in and around the Credit Forks ANSI is plotted on Figure 6. Eighteen (18) landowners, holding about 172 hectares within the ANSI (51% of the land total) have signed private stewardship agreements, recognizing the need to conserve the natural features of their lands (Moull 1988). Two landowners, holding 5 ha of the ANSI (less than 2%), expressed no interest in negotiating such agreements (Appendix B1). Presently, at least 12.1 ha (3.6% of the ANSI) is owned by a land development company. All owners of lands within the ANSI are eligible for property tax reduction through the Conservation Land Tax Reduction Program initiated by the Ontario government in 1988.

The Ontario Heritage Foundation owns 39.4 ha (nearly 12% of the ANSI) and the use of that property has yet to be finalized. The presence of the Willoughby house complicates decision-making for this property. The ANSI program staff identified significant natural features, tableland and slope forests and riparian communities, on this property (Belan 1987; J. Riley, pers. comm.). They recommended that such areas would be most appropriately managed to the standards of Provincial Nature Reserves but decisions are still pending (J. Riley, pers. comm.).

RECOMMENDATIONS

1. The Credit Forks ANSI is a natural area of high scenic quality with physical and biological features of that have limited occurrence in the Dufferin Section of the Niagara Escarpment. When compared with other areas in the Dufferin Section, these physical and biological features are best developed and most characteristically expressed at Credit Forks ANSI. On this basis, the area fully merits its designation as a provincially significant Area of Natural and Scientific Interest.

2. The significance of the Credit Forks ANSI should be brought to the attention of the Town of Caledon, the Regional Municipality of Peel, the Credit Valley Conservation Authority and the Niagara Escarpment Commission. The interest of the ministry, as well as the general intent and goals of the ANSI program should be presented to these bodies and they should be apprised of the success of the private lands stewardship program. In particular, the Town of Caledon should be encouraged to adopt an appropriate environmental planning and protection policy during its Official Plan revision.

3. All building permits, development applications and severance proposals should be reviewed by Ministry of Natural Resources field staff to identify all direct and indirect impacts. Where significant impact upon the natural features of the area is anticipated, impact assessment and mitigation statements should be required of the development proponents. The criteria of the Niagara Escarpment Plan, the Conservation Authority and ministry should be addressed and satisfied in the documents submitted by development proponents.

4. Any activities affecting drainage, the run-off of surface waters or riparian/lowland communities should be guided by the recommendations of the Maple District Fisheries Management Plan (OMNR 1988). In addition, any culverts or drains which are installed on the tableland should not be permitted to discharge on the slopes of the escarpment or over the escarpment brow.

5. If any protective setbacks are presently recognized for the rim of the escarpment by the Municipality or the Conservation Authority, an increase in their width should be considered by the agency involved. A minimum of 10 m should be considered. If setbacks are not presently established they should be implemented and clearing to the escarpment brow should be discouraged. Although the escarpment is a stable landform, the potential for collapse at the rim must be recognized as a phenomenon that occurs within a time frame comparable to regional storm events (50-100 years). Also, such setbacks would maintain the aesthetic integrity of the escarpment face and brow.

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APPENDIX A

1. Plant species identified in the Credit Forks ANSI, 1988-1989 (Species observed in earlier work or reported by previous observers are listed in Section 3, below.)

SCIENTIFIC NAME	COMMON NAME	COMMUNITY
	TREES (23 species)	
Abies balsamea	balsam fir	1b
Acer saccharum	sugar maple	1,5b
Betula alleghaniensis	yellow birch	1b
B. papyrifera	white birch	1,5b
Fagus grandifolia	beech	1a,b,c
Fraxinus americana	white ash	1
F. nigra	black ash	1b
F. pennsylvanica	red ash	1c
Juglans cinerea	butternut	1b,d
Ostrya virginiana	hop-hornbeam	1a,b
Pinus strobus	white pine	1a,c,c
+ P. sylvestris	scots pine	1a(edge),5b
Populus balsamifera	balsam poplar	1a,c,e,5a
P. deltoides	eastern cottonwood	5a
P. grandidentata	large-toothed aspen	1b
P. tremuloides	trembling aspen	1,2,5a,b
Prunus serotina	black cherry	1a,b,c
+ Pyrus malus	apple	1a,b
+ Salix cf. fragilis	crack willow	1b
Thuja occidentalis	white cedar	1,1b,4,5a,b
Tilia americana	basswood	1a,b,c
Tsuga canadensis	eastern hemlock	1a,b,c
Ulmus americana	white elm	1b,d,e,2,5b
	SHRUBS, SMALL TREES & VINES (24 species)	
Acer spicatum	mountain maple	1b,e
Carpinus caroliniana	blue-beech	1b
Celastrus scandens	climbing bittersweet	1b,c,5a
Cornus alternifolia	alternate-leaved dogwood	1a,b,c
C. rugosa	round-leaved dogwood	1a,b
C. stolonifera	red osier	1b,d,e,5a
Corylus cornuta	beaked hazel	1b
Dirca palustris	leatherwood	1a
Lonicera canadensis	fly honeysuckle	1b
+ L. tatarica	tartarian honeysuckle	2
Parthenocissus vitacea	Virginia creeper	1b,e,2,3,5a
Prunus pensylvanica	pin cherry	1a,b
P. virginiana	chokecherry	1a,b,c,d,5a,b
Rhus typhina	staghorn sumac	1b,d,5a,b

+ Non-native or introduced species.

SHRUBS, SMALL TREES AND VINES, continued

Ribes cynosbati	prickly gooseberry	1a,b,c,4
Rubus allegheniensis	mountain blackberry	1a,b,c,5a
R. occidentalis	black raspberry	1b
R. odoratus	purple-flowering raspberry	1b
R. strigosus	red raspberry	1,2,4,5a,b
Salix spp. (*)	willows	1b,d,e,2,5b
S. amygdaloides	peach-leaved willow	1b
Sambucus pubens	red-berried elder	1a,b,c
Taxus canadensis	Canada yew	1b
Vitis riparia	riverbank grape	1b,e,2,5b

FERNS & ALLIES (18 species)

Adiantum pedatum	maidenhair fern	1a,b
Botrychium virginianum	rattlesnake fern	1a,b
Camptosorus rhizophyllus	walking fern	1b
Cystopteris bulbifera	bulblet fern	1b,e,2,4
C. fragilis	fragile fern	1b,4
Dryopteris carthusiana	spinulose woodfern	1a,b
D. intermedia	intermediate woodfern	1a,b,c
D. marginalis	marginal woodfern	1a,b,c
Equisetum arvense	field horsetail	1b,5a
E. variegatum	variegated scouring-rush	1a(edge)
Lycopodium lucidulum	shining clubmoss	1b
L. obscurum	running ground-pine	1b
Matteuccia struthiopteris	ostrich fern	1b,2
Onoclea sensibilis	sensitive fern	1b,e,2
Pellaea glabella (*)	smooth cliff brake	4
Polypodium vulgare	common polypody	1b
Polystichum acrostichoides	christmas fern	1a,b
Pteridium aquilinum	bracken	5a,b

GRAMINOIDS (44 species)

+	*Agropyron repens*	quack grass	5a
+	*Agrostis stolonifera*	creeping bent	2,5d
+	*Bromus inermis*	Hungarian brome	5a
	Carex albursina	sedge	1a
	C. arctata	sedge	1a,b
	C. bebbii (*)	sedge	2,5d
	C. deweyana (*)	sedge	1a,b
	C. eburnea	sedge	1b
	C. flava	sedge	5a
	C. hitchcockiana (*)	sedge	1a
	C. hystericina (*)	sedge	3,5a,d
	C. pensylvanica (*)	sedge	1a,b
	C. plantaginea	sedge	1a,b

* = specimen collected; vouchers will be deposited in the herbarium at Erindale College, University of Toronto (TRTE).

GRAMINOIDS, continued

	Carex platyphylla	sedge	1b
	C. retrorsa (*)	sedge	3,5d
	C. rosea	sedge	1b
	C. sparganioides	sedge	1b
	C. stipata	sedge	1b,5a
	C. tribuloides	sedge	1b
	C. vulpinoidea	sedge	1b
+	Dactylis glomerata	orchard grass	2,5a,b
+	Echinocloa crus-galli	barnyard grass	2
	Eleocharis spp.	spike-rush	2
	Elymus hystrix	bottlebrush grass	1a,b,c
	E. cf. virginicus	Virginia wild-rye	2
	Festuca obtusa (*)	nodding fescue	1a,b
+	F. pratensis	meadow fescue	2,5a,b
	Glyceria striata	fowl manna grass	1b,e,2,3
	Juncus dudleyi (*)	path rush	2,5a
	Leersia oryzoides	rice cut grass	2
	Muhlenbergia sp.	muhly grass	2
	Oryzopsis asperifolia	mounatin-rice	1b
	Panicum capillare	witch grass	5a,d
	Phalaris arundinacea	reed canary grass	2
+	Phleum pratense	timothy	5a,b
+	Poa compressa	Canada blue grass	1b,4,5a,b
+	P. nemoralis (*)	wood blue grass	1a
	P. palustris	fowl blue grass	2,3
+	P. pratensis	Kentucky blue grass	5a,b,d
	Schizachne purpurascens	false melic grass	1a,b
	Scirpus atrovirens	bulrush	3,5a
	S. cyperinus	wool-grass	1c
	Typha angustifolia	narrow-leaved cattail	5a
	T. latifolia	common cattail	1c,3,5a

FORBS (151 species)

	Achillea millefolium	yarrow	5a
	Actaea pachypoda	doll's-eyes	1a,b
	A. rubra	red baneberry	1a,b,c
+	Alliaria petiolata	garlic mustard	1a
	Allium tricoccum	wild leek	1a
	Ambrosia artemisiifolia	ragweed	5a,b
	Anemone canadensis	Canada anemone	2,5a
	A. cylindrica	thimbleweed	1b,5a
	Apocynum androsaemifolium	spreading dogbane	5a
	Aquilegia canadensis	wild columbine	1a,4
	Aralia nudicaulis	wild sarsaparilla	1a,b,c
	A. racemosa	spikenard	1b,4
+	Arctium minus	common burdock	1b,5a,b
	Arisaema triphyllum	jack-in-the-pulpit	1a,b
+	Artemisia vulgaris	mugwort	5a
	Asarum canadense	wild ginger	1a,b,c

FORBS, continued

	Asclepias incarnata	swamp milkweed	2,3,5d
	A. syriaca	common milkweed	2,5a
	Aster cordifolius	heart-leaved aster	1a,b,c,5a
	A. lateriflorus	calico aster	2
	A. macrophyllus	large-leaved aster	1a,b,c
	A. puniceus	red-stemmed aster	2
	A. simplex	panicled aster	2,5a
+	Barbarea vulgaris	winter cress	2
	Bidens cernua	beggar-ticks	2,3
	B. frondosa	beggar-ticks	2
	Callitriche verna (*)	water starwort	2
	Caltha palustris	marsh marigold	2
	Caulophyllum thalictroides	blue cohosh	1a,b,c
+	Cerastium vulgatum	mouse-ear chickweed	2
+	Chelidonium majus	celandine	1b
	Chelone glabra	turtlehead	2
+	Chrysanthemum leucanthemum	ox-eye daisy	1b,2,5a,b
+	Cichorium intybus	cichory	5a
	Circaea alpina	dwarf enchanter's nightshade	1b
	C. quadrisulcata	enchanter's nightshade	1
+	Cirsium arvense	Canada thistle	3,5a,b
+	C. vulgare	bull thistle	1b,2
	Clematis virginiana	virgin's bower	2,5a
+	Coronilla varia	crown vetch	1a(edge)
	Cypripedium calceolus	yellow lady's-slipper	1b
+	Daucus carota	wild carrot	2,5a
	Dentaria diphylla	toothwort	1a,b
	Diervilla lonicera	bush-honeysuckle	1b,4
	Echinocystis lobata	wild cucumber	2
+	Echium vulgare	viper's bugloss	5a,b
+	Epilobium parviflorum (*)	willow-herb	1b,2
+	Epipactis helleborine	helleborine	1a,b
	Erigeron annuus	daisy fleabane	1b
	E. philadelphicus	Philadelphia fleabane	5a
	E. strigosus	daisy fleabane	1a(edge)
+	Erysimum cheiranthoides	wormseed mustard	2
	Erythronium americanum	yellow trout lily	1
	Eupatorium maculatum	spotted joe-pye weed	1b,2,3
	E. perfoliatum	boneset	1c
	E. rugosum	white snakeroot	1b,2
	Fragaria vesca	woodland strawberry	1b,2
	F. virginiana	common strawberry	1,2,5a
+	Galeopsis tetrahit	hemp-nettle	1b,2
	Galium lanceolatum	wild licorice	1a
	G. palustre (*)	marsh bedstraw	2
	G. triflorum	fragrant bedstraw	1a,b
	Geranium robertianum	herb-robert	1a,b,c,4
	Geum aleppicum	yellow avens	1a(edge)
	G. canadense	white avens	1a,b,c
	Hackelia virginiana	stickseed	1b

FORBS, continued

Hepatica acutiloba	sharp-lobed hepatica	1a,b
+ Hesperis matronalis	dame's-rocket	2,5a
+ Hieracium pratense	yellow hawkweed	1b,5a,b
Hydrocotyle americana	water pennywort	2
Hydrophyllum canadense	Canada waterleaf	1a
H. virginianum	Virginia waterleaf	1a,b
+ Hypericum perforatum	common St. John's-wort	5a
Impatiens capensis	spotted jewelweed	1b,e,2,3,5d
Laportea canadensis	wood nettle	1a,b,2
Lemna minor	duckweed	3
+ Leonurus cardiaca	motherwort	1a,5a
Lobelia inflata	indian-tobacco	2
L. siphilitica	great lobelia	2
+ Lotus corniculatus	bird's-foot trefoil	5a
Lycopus uniflorus	northern bugleweed	2,3
Lysimachia ciliata	fringed loosestrife	2
Maianthemum canadense	Canada mayflower	1
+ Medicago lupulina	black medic	5a,b
+ M. sativa	alfalfa	5a
+ Melilotus alba	white sweet clover	2,5a,b
Mentha arvensis	common mint	2
Mitella diphylla	mitrewort	1b
M. nuda	naked mitrewort	1b
+ Myosotis scirpioides (*)	forget-me-not	2
Nasturtium officinale	water cress	2
+ Nepeta cataria	catnip	1b
Oenothera parviflora	evening-primrose	5a
Osmorhiza claytonii	sweet cicely	1a,b,c
Phryma leptostachya	lopseed	1b
Pilea pumila	clearweed	1a,b,2
+ Plantago lanceolata	English plantain	5a
+ P. major	common plantain	2
P. rugellii	Rugel's plantain	1c
Polygonatum pubescens	hairy false Solomon's seal	1a,b
Polygonum spp.	knotweeds	2
Potentilla norvegica	rough cinquefoil	1b
+ P. recta	rough-fruited cinquefoil	1a(edge),2,5b
Prenanthes sp.	white-lettuce	1b
+ Prunella vulgaris	heal-all	1b,2,5a
Ranunculus abortivus	kidney-leaved buttercup	1b,2
+ R. acris	common buttercup	1b
R. hispidus	bristly buttercup	1b
+ Rumex crispus	curled dock	2
+ R. obtusifolius	bitter dock	2
Sagittaria latifolia	broad-leaved arrowhead	2,5d
Sanguinaria canadensis	bloodroot	1a,b
+ Satureja acinos (*)	mother-of-thyme	5a
S. vulgaris	wild basil	5a,b
Scutellaria lateriflora	mad-dog skullcap	2
+ Silene vulgaris	bladder campion	5a

	Sium suave	water parsnip	3,5d
	Smilacina racemosa	false Solomon's seal	1a,b,5a
	Smilax herbacea	carrion flower	1b
+	*Solanum dulcamara*	climbing nightshade	1b,2
	Solidago altissima	tall goldenrod	2,5a
	S. caesia	blue-stemmed goldenrod	1a,b,c
	S. canadensis	Canada goldenrod	1b,2,5a
	S. flexicaulis	zig-zag goldenrod	1a,b,c
	S. graminifolia	grass-leaved goldenrod	1b
	Solidago nemoralis (*)	gray goldenrod	1c
	S. rugosa (*)	rough-stemmed goldenrod	1b
+	*Sonchus arvensis*	sow thistle	2
+	*Taraxacum officinale*	dandelion	1a,b
	Thalictrum dioicum	early meadow-rue	1b
	T. polygamum	tall meadow-rue	2
	Tiarella cordifolia	foam flower	1b
+	*Tragopogon pratensis*	goat's-beard	5a
+	*Trifolium repens*	white clover	1c
	Trillium grandiflorum	white trillium	1a,b,c
+	*Tussilago farfara*	colt's-foot	1b,5a
	Urtica dioica	stinging nettle	2
	Uvularia grandiflora	large-flowered bellwort	1a
+	*Verbascum thapsus*	common mullein	5a
	Verbena hastata	blue vervain	2
	Verbena urticifolia	white vervain	2
+	*Veronica anagallis-aquatica*	water speedwell	2
+	*V. longifolia*	long-leaved speedwell	2
+	*V. officinalis*	common speedwell	1b,c
+	*Vinca minor*	periwinkle	1a
	Viola canadensis	Canada violet	1a,b
	V. cucullata	marsh blue violet	1b
	V. rostrata	long-spurred violet	1b
	V. pubescens	downy yellow violet	1a,b
	V. sororia	woolly blue violet	1a,b

2. Animal species identified in the Credit Forks ANSI, 1988-1989

SCIENTIFIC NAME	COMMON NAME	COMMUNITY LOCATION
	HERPTILES	
Rana pipiens	Leopard frog	2
R. sylvestris	Wood frog	1a

	BIRDS BREEDING STATUS		
	Possible	Probable	Confirmed
Ruffed Grouse	SH*		
Red-tailed Hawk	SH		
Turkey Vulture	SH		NE**
Eastern Pewee	SH		
American Crow	SH		
Blue Jay	SH		
Black-capped Chickadee	SH		
White-breasted Nuthatch	SH		
Brown Creeper	SH		
Brown Thrasher	SH		
American Robin	SH		
Veery	SH		
Wood Thrush	SM		
Black-throated Green Warbler	SM		
Black-and-white Warbler	SH		
Ovenbird	SM		
American Goldfinch	SH		
Rose-breasted Grosbeak	SH		
Song Sparrow	SH		

* SH = species observed in suitable nesting habitat.
SM = singing male heard in suitable habitat in nesting season.
** Catling (in litt. 1989) reports nests in the early-1960's.

MAMMALS

Peromyscus leucopus or P. maniculatus Deer or White-footed mouse
(numerous tracks in snow on slopes; both species may be present)
Tamias striatus Eastern chipmunk
(1 seen on slope)
Erethizon dorsatum Porcupine
(typically debarked trees on slopes and terraces)
Procyon lotor Raccoon
(4 young seen on tableland)
Odocoileus virginianus Whitetail deer
(several sets of tracks near base of slopes and on stream banks)

3. Species of plants and animals observed during earlier work or reported from Credit Forks ANSI by previous surveyors. The list of birds is supplemented by the data from Credit Forks Provincial Park (Gould 1984)

TREES

Acer negundo	Mantioba maple	(J. Riley, in Belan 1987)
A. rubrum	red maple	(Lindsay 1976)

FERNS

Asplenium trichomanes	maidenhair spleenwort	(Lindsay 1976)
A. viride	green spleenwort	(Kaiser 1976 notes; Catling in litt. 1989)
Athyrium filix-femina	lady fern	(Lindsay 1976)
Dryopteris cristata	crested fern	(Lindsay 1976)
Phyllitis scolopendrium	hart's-tongue fern	(Catling in litt. 1989)

GRAMINOIDS

Melica smithii	melic grass	(Lindsay 1976)

FORBS

Epifagus virginiana	beech drops	(Lindsay 1976)
Panax quinquefolium	ginseng	(Lindsay 1976, in litt. 1989)
Sanicula marilandica	black snakeroot	(Lindsay 1976)
Trientalis borealis	star flower	(Lindsay 1976)

FISH

Salvelinus fontinalis	Brook trout	(Martin 1982)
Catostomus commersoni	White sucker	(Martin 1982)
Rhinichthys atratulus	Blacknose dace	(Martin 1982)
Semotilus atromaculatus	Creek chub	(Martin 1982)
Lepomis gibbosus	Pumpkinseed	(Martin 1982)
Cottus bairdi	Mottled sculpin	(Martin 1982)

AMPHIBIANS

Rana palustris	Pickerel frog	(Catling in litt. 1989)

BIRDS (from Gould 1984)

(Species are listed only if they were not observed in the ANSI or if the breeding status is upgraded. See following page for meaning of breeding status codes)

	BREEDING STATUS		
	Possible	Probable	Confirmed
Northern Harrier			FY
American Kestrel		P	
Rock Dove	SH		
Mourning Dove	P		
Chimney Swift	SH		
Belted Kingfisher		FS	

	BREEDING STATUS		
	Possible	Probable	Confirmed
Common Flicker	D		
Yellow-bellied Sapsucker	SH		
Downy Woodpecker	SH		
Eastern Kingbird			FY
Great-crested Flycatcher		T	
Eastern Phoebe	SH		
Eastern Pewee			NY
Tree Swallow		V	
Bank Swallow	SH		
Rough-winged Swallow	SH		
Barn Swallow		D	
Cliff Swallow	SH		
Black-capped Chickadee		FS	
White-breasted Nuthatch			AE
Gray Catbird			FS
Brown Thrasher			P
American Robin			FS
Cedar Waxwing			FY
European Starling			FS
Red-eyed Vireo			FY
Warbling Vireo	SH		
Yellow Warbler			FS
Ovenbird		P	
Northern Waterthrush	SH		
Mourning Warbler	SM		
Common Yellowthroat	SM		
House Sparrow			FY
Bobolink			FS
Eastern Meadowlark			FY
Red-winged Blackbird			NE
Northern Oriole			NY
Common Grackle			FY
Brown-headed Cowbird		P	
Scarlet Tanager			FY
Northern Cardinal		P	
Rose-breasted Grosbeak		P	
Indigo Bunting		A	
American Goldfinch		FS	
Savannah Sparrow			FS
Vesper Sparrow			FS
Chipping Sparrow			FS
Field Sparrow	SM		
Song Sparrow			FS

Breeding status codes: A = adult exhibiting agitated behaviour; AE = adult entering or leaving nest site in circumstances indicating an occupied nest; D = courtship or display; FS = adult carrying food or fecal sac; FY = fledged young; NE = nest with eggs; NY = nest with young; P = pair observed in suitable nest habitat in breeding season; SH = species in suitable habitat during breeding season; SM = singing male in breeding habitat; T = territorial behaviour by adults; V = adults visiting a probable nest site.

APPENDIX B

Key to the landowner map of Credit Forks ANSI

Map No.	NHSA**	Parcel Acreage	ANSI Acreage*
6-151	YES	25.8 ac	13 ac
6-152	YES	22.6 "	12 "
6-153	NO	27.5 "	8 "
6-169	YES	269.9 "	269.9 "
6-236		2.0 "	2.0 "
6-237		100 "	100 "
8-116		3.3 "	1.6 "
8-117	YES	3.1 "	3.1 "
8-118		3.2 "	2.1 "
8-119		3.3 "	0.2 "
8-125	YES	3 "	2.4 "
8-126	YES	3.0 "	3.0 "
8-127		3.2 "	3.2 "
8-128	YES	3.4 "	3.4 "
8-129	YES	3.5 "	3.5 "
8-131	YES	4.8 "	4.8 "
8-132		7.2 "	7.2 "
8-133	YES	6.6 "	6.6 "
8-134	YES	5.3 "	5.3 "
8-135	YES	5.3 "	5.3 "
8-136		5.7 "	5.7 "
8-137		6.4 "	6.4 "
8-138		5.9 "	5.9 "
8-139		6.2 "	6.2 "
8-140		7.3 "	6.5 "
8-141	YES	8.1 "	8.1 "
8-142		7.2 "	7.2 "
8-143		8.4 "	8.4 "
8-144		4.8 "	2 "
8-211		57.1 "	30 "
8-221		70 "	70 "
8-223		9 "	9 "
8-291	YES	14.9 "	14.6 "
8-338		2.9 "	0.5 "
8-339		2.9 "	2.2 "
8-340		3.2 "	1.4 "

* ANSI acreage has been taken from Moull (1988) or estimated where data was lacking or apparently in error.

** NHSA = Natural Heritage Stewardship Agreement.

Key to the landowner map of Credit Forks ANSI, continued

Map No.	NHSA	Parcel Acreage	ANSI Acreage
8-341		2.7 ac	1.5 ac
8-349		3.3 "	0.2 "
8-350		2.6 "	0.2 "
8-351		2.8 "	0.2 "
8-352		2.6 "	1.2 "
8-361		3.1 "	0.1 "
8-362		3.2 "	0.1 "
9-005		1.1 "	0.1 "
9-007		20.7 "	10.5 "
9-059		0.5 "	0.1 "
9-061	YES	7.4 "	7.1 "
9-063		0.5 "	0.1 "
9-064		0.5 "	0.2 "
9-065		0.3 "	0.1 "
9-067		0.5 "	0.1 "
9-069		0.3 "	0.1 "
10-112	YES	200.6 "	35 "
10-113		35.7 "	4 "
10-114		33 "	4 "
10-115	NO	38.7 "	4 "
10-164		27.2 "	20 "
10-167	YES	3.8 "	3.8 "
10-174	YES	9.3 "	8 "
10-174-20		2.6 "	2.5 "
10-175		0.2 "	0.1 "
10-178		0.5 "	0.2 "
10-179		0.5 "	0.4 "
10-180		0.2 "	0.1 "
10-186		40 "	35 "
10-187	YES	27.6 "	15 "

AREA OF NATURAL AND SCIENTIFIC INTEREST – LIFE SCIENCE INVENTORY CHECK-SHEET

NAME	MAP NAME	MAP NUMBER	UTM REF.
Credit Forks	Bolton	30 M/13 17	5820-48500

COUNTY, DISTRICT or REGIONAL MUNICIPALITY: Peel

LAT.: 43° 48'N | LONG.: 79° 59'W | ALT. MIN. MAX.: 293-455 m

LOCALITY: 1 km east of Belfountain

TOWNSHIP	LOTS	CONCESSIONS
Caledon	Lots 6-9	Conc. 3W
	" 6-10	" 4W
	" 9 & 10	" 5W

AREA: 835 acres 337 ha

OWNERSHIP: Private/Cons. Auth./OHF

ADMINISTRATION: Private/Cons. Auth./MNR

FOREST REGION AND DISTRICT	SITE REGION AND DISTRICT
L.1	6-7

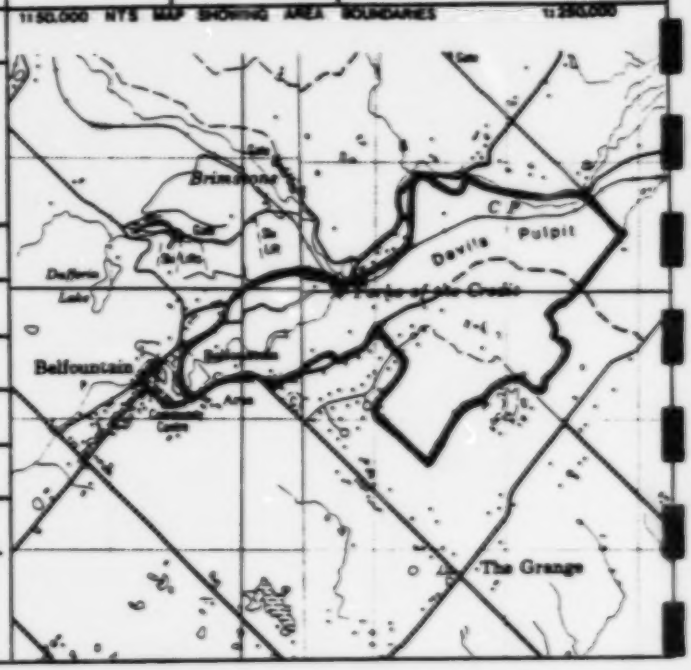
MNR REGION AND DISTRICT	CONSERVATION AUTHORITY
Central/Maple	Credit

AERIAL PHOTOGRAPHS — BASE MAP: 447794

YEAR	ROLL	FLIGHT LINE	NUMBERS
1978	43	4355	90-94
	65	4356	100-104

OBM: 10-17-5750-48450 & 48500

1:50,000 NTS MAP SHOWING AREA BOUNDARIES 1:250,000



PHYSICAL AND BIOLOGICAL FEATURES

Encompassing nearly 1000 m of exposed cliff face, this natural area at Credit Forks includes dramatic scenery, outstanding earth science features and representative vegetation along the Dufferin Section of the Niagara Escarpment. Excellent examples of talus slope communities are present including lichen-moss, moss-fern-herb and white birch-white cedar forest. South of the escarpment brow, the rolling tableland is a regionally significant example of the Paris moraine. The moderately mature sugar maple forest on this tableland is one of the most extensive forest tracts in Peel and one of the largest, mature tracts associated with the Dufferin Section. The site also includes moderately mature slope, terrace, valley floor and bottomland forest communities, as well as riparian, seasonal wetland and aquatic plants and communities. A large wildlife population appears to be resident in this natural area.

The Erin Branch of the Credit River spills over the escarpment in a short re-entrant valley, at the head of which is the Belfountain Conservation Area. At Credit Forks the Erin and Alton branches of the river meet. The section downstream of the confluence is the most productive trout spawning section of the river and the most heavily fished.

DATA SHEETS ATTACHED

PHYSICAL DESCRIPTION	☐	SUMMARY SPECIES LISTS	☐
VEGETATION SUMMARY	☐	PHYSICAL FEATURES MAP	☐
EVALUATION SHEET	☐	VEGETATION MAP	☐
COMMUNITY DESCRS.	☐	BIBLIOGRAPHY	☐
COMMUNITY COMP. LISTS	☐	PHOTOGRAPHS	☐

MAJOR INFORMATION SOURCES

Lindsay, K. 1976. Field work.
Riley, J. 1987. Field work.
Kaiser, J. 1988-89. Field work.

EVALUATION AND PRIORITIES

Excellent representation of regionally typical forest communities in combination with the Niagara Escarpment and the Credit River make it an outstanding site.

DATE COMPLETED	COMPILER
October, 1988	J. Kaiser

Ontario Ministry of Natural Resources, Parks and Recreational Areas Programme, Queen's Park, Toronto, Ontario M7A 1W3

APPENDIX D: GENERAL INFORMATION SHEET - CREDIT FORKS AREA OF NATURAL AND SCIENTIFIC INTEREST

Niagara Escarpment and the Paris Moraine

Most of southern Ontario south of the Precambrian Shield is covered with a considerable depth of soil material that was deposited by the retreating ice sheets of the Wisconsin Glaciation, the most recent "ice age". During the retreat of the glaciers, great lakes appeared and receeded and high volumes of water eroded large areas of glacial sediment. Thus was exposed the Niagara Escarpment, the most dramatic bedrock feature of southern Ontario. South of the escarpment at Credit Forks, a rolling plain of the Paris moraine represents the drift left behind by the retreating glaciers. A distinctive suite of forest communities have developed in association with the escarpment, including tableland, rim, slope, talus, terrace and toe forest, most of which are present at Credit Forks.

Credit River

With a sport fishery that continues to improve, the Credit River is growing in value and popularity as a recreational resource. The upper Credit has a long history as a trout spawning and fishing area. With improvements to water quality and the river banks, the river at Credit Forks is one of the most heavily fished in the Toronto region.

Inventory of Areas of Natural and Scientific Interest (ANSI)

The ANSI Program of the Ministry of Natural Resources has identified life science and earth science features and sites which best represent the vegetation and landforms of Ontario. Criteria such as representation, diversity, condition and special features are used to select Areas of Natural and Scientific Interest. Biological inventories of these areas have also bee initiated to further identify their significance and the re-evaluate the boundaries of these sites.

Significance of Credit Forks Area of Natural and Scientific Interest

Credit Forks ANSI consists of 337 hectares including 314 ha of moderately mature forest on the tablelands, slopes and bottomland associated with the Dufferin Section of the Niagara Escarpment. Topographic relief varies by more than 100 m and many dramatic vistas are present. The vegetation is relatively unaffected by development and the escarpment and its biota appear much as they would have before human settlement. At the west end of the area, the Erin Branch of the Credit River spills over the escarpment and runs through a short re-entrant valley to its confluence with the Alton Branch at Credit Forks. The main channel of the Credit parallels the northern boundary of the natural area, swinging south into the area in its northeast corner.

For additional information contact: Regional Ecologist
Parks & Recreational Areas Section
Ministry of Natural Resources
820 Yonge Street South
Aurora, Ontario L4G 3G8
(416) 841-9348

MAPS
NOT
FILMED

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